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AN ULTRAVIOLET-VISIBLE SPECTROPHOTOMETER AUTOMATION SYSTEM - PART III PROGRAM DOCUMENTATION

by

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The Ultraviolet-Visible Spectrophotometer (UVVIS) automation system accomplishes "on-line" spectrophotometric quality assurance determinations, report generations, plot generations and data reduction for chlorophyll or color analysis. This system also has the capability to process manually entered data for the analysis of chlorophyll or color.

For each program of the UVVIS system, this document contains a program description, flowchart, variable dictionary, code listing, and symbol cross-reference table. Also included are descriptions of file structures and of routines common to all automated analyses.

The programs are written in Data General extended BASIC, Revision 4.3, under the RDOS operating systems, Revision 6.2. The BASIC code has been enhanced for real-time data acquisition, which is accomplished by CALLS to assembly language subroutines.

Two other related publications are "An Ultraviolet-Visible Spectrophotometer Automation System - Part I Functional Specifications," and "An Ultraviolet-Visible Spectrophotometer Automation System - Part II User's Guide."

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FOREWORD

Environmental measurements are required to determine the quality of ambient waters and the character of waste effluents. The Environmental Monitoring and Support Laboratory - Cincinnati, conducts research to:

- Develop and evaluate techniques to measure the presence and concentration of physical, chemical, and radiological pollutants in water, wastewater, bottom sediments, and solid waste.
- Investigate methods for the concentration, recovery, and identification of viruses, bacteria, and other microbiological organisms in water, and to determine the responses of aquatic organisms to water quality.
- Develop and operate an Agency-wide quality assurance program to assure standardization and quality control of systems for monitoring water and wastewater.
- Develop and operate a computerized system for instrument automation leading to improved data collection, analysis, and quality control.

This report was developed in the Advanced Instrumentation Section of the Environmental Monitoring and Support Laboratory in the interest of advancing laboratory techniques and quality control through computerization.

Robert L. Booth

Robert L. Booth, Acting Director
Environmental Monitoring and Support
Laboratory - Cincinnati

ABSTRACT

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SECTION 1

INTRODUCTION

The structure of the Ultraviolet-Visible Spectrophotometer (UVVIS) automation system is that of a network of interrelated programs or "modules." Each module can call into action other modules which are at adjacent functional levels. (See Figure 1.) This figure illustrates the system's hierarchical command structure.

The system handles all escapes and errors. This feature prevents a user from gaining access to BASIC command level and thereby prohibits changes to the code of the system modules.

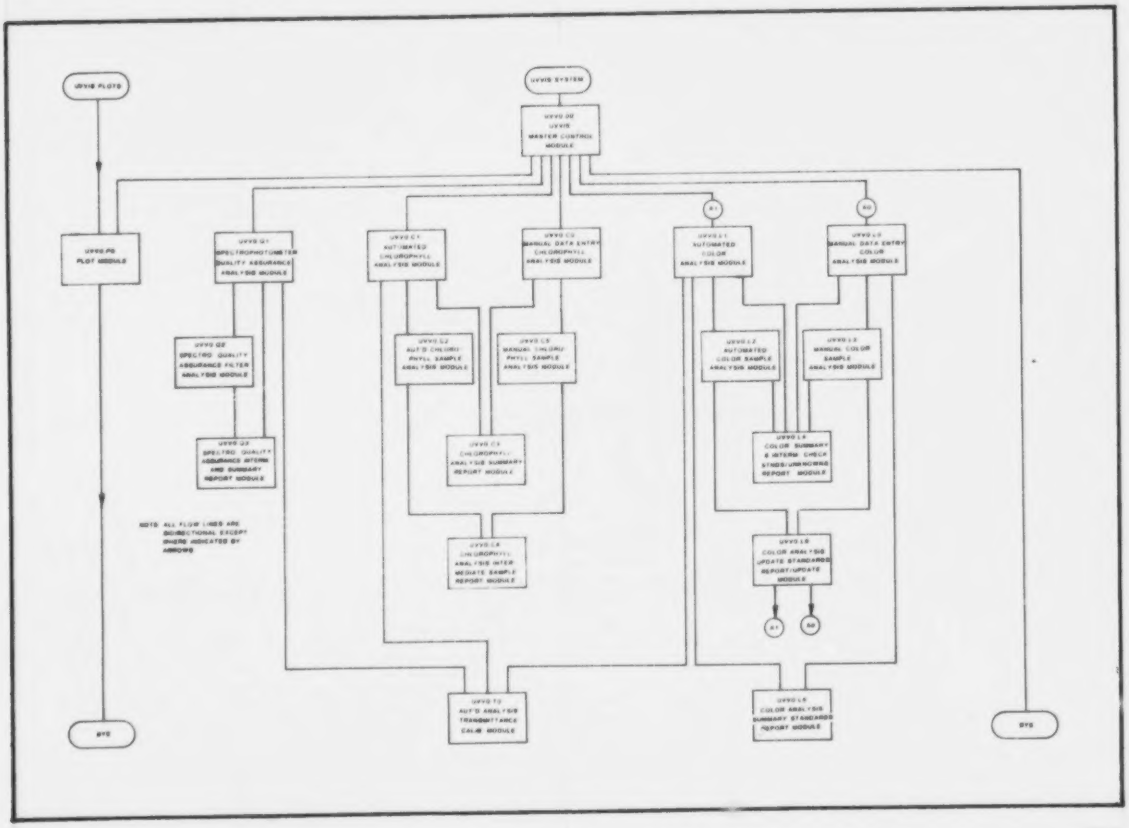
UVVIS PLOTS
UVVIS SYSTEM
UVV0.00 UVVIS MASTER CONTROL MODULE
UVV0.P0 PLOT MODULE
UVV0.Q1 SPECTROPHOTOMETER QUALITY ASSURANCE ANALYSIS MODULE
UVV0.Q2 SPECTRO QUALITY ASSURANCE FILTER ANALYSIS MODULE
UVV0.Q3 SPECTRO QUALITY ASSURANCE INTERIM AND SUMMARY REPORT MODULE
UVV0.C1 AUTOMATED CHLOROPHYLL ANALYSIS MODULE
MANUAL DATA ENTRY CHLOROPHYLL ANALYSIS MODULE
UVV0.C2 AUT'D CHLORO-PHYLL SAMPLE ANALYSIS MODULE
UVV0.C5 MANUAL CHLORO-PHYLL SAMPLE ANALYSIS MODULE
UVV0.C3 CHLOROPHYLL ANALYSIS SUMMARY REPORT MODULE
UVV0.C4 CHLOROPHYLL ANALYSIS INTER-MEDIATE SAMPLE REPORT MODULE
A1
A0
UVV0.L1 AUTOMATED COLOR ANALYSIS MODULE
MANUAL DATA ENTRY COLOR ANALYSIS MODULE
UVV0.L2 AUTOMATED COLOR SAMPLE ANALYSIS MODULE
UVV0.L3 MANUAL COLOR SAMPLE ANALYSIS MODULE
UVV0.L4 COLOR SUMMARY & INTERIM CHECK STNDS/UNKNOWNS REPORT MODULE
COLOR ANALYSIS UPDATE STANDARDS REPORT/UPDATE MODULE
A1
A0
NOTE ALL FLOW LINES ARE BIDIRECTIONAL EXCEPT WHERE INDICATED BY ARROWS
UVV0.T0 AUT'D ANALYSIS TRANSMITTANCE CALIB MODULE
COLOR ANALYSIS SUMMARY STANDARDS REPORT MODULE
BYE
BYE

Figure 1. Interrelationship of the UVVIS modules.

SECTION 2

MASTER CONTROL

Master control is the highest system command level, from which a particular major function or analysis is chosen. The master control module operates solely at this level, and initializes the system status parameter file.

MASTER CONTROL MODULE -- UVV0.00

UVV0.00 is chained to by INITIALIZE or by any of the main analysis or plot modules. (Chaining is the process by which one program invokes the loading and execution of another program.) The flow of this module is depicted in Figure 2.

System parameters are retrieved from the system status transfer file UVV00.TR. Should this file be non-existent, an error flag is set and the user is forcibly logged off the system. The program location variables, that is, the "previous", "present", and "destination" program names are then modified.

The master commands are presented to the user. Based on the command, one of five routes may be taken. As in any UVVIS command line, the "H" command (or simply a carriage return) cues a terminal display of explanations of the command functions.

The "E" command always directs program control to the ending section. In all modules, except the master command module, an ESCape is the same as an "E" command. But at master command level, an ESCape will only provoke a repetition of the master command prompt, while the "E" command will BYE out the system.

Before any chaining or BYEing out, the "destination" program name is defined and all program location variables (see variables F1$, F2$ and F3$ of Table 1) are written to the system status transfer file. In UVV0.00, the run-mode and error flags are also written to this file.

The "CM" and "LM" commands route control to the section for preparation of manual data-entry runs. In this section, the proper "destination" program name is defined, and the analyst's and instrument's names displayed to the user for approval or change. The run-mode flag is then set for "manual" runs, followed by a chain to the appropriate analysis module.

The "C", "L", and "Q" commands send control to the automated analysis preparation section. A CALL 257[1] is issued to stop the scanning motor, should it be on. The correct "destination" program name is defined, and the instrument set-up and checkout procedure follows. Once completed, the run-mode flag is set for "automated" runs, and the program chains to the correct analysis module.

Instrument Set-Up and Checkout

If the run-mode flag is not already set for "automated" runs, then the user may see set-up instructions, and must change or approve the present analyst and instrument names.

The user may elect to test the outputs and function of the various channels, in which case the program presents three options: transmittance signal check; wavelength signal check; or scan function check. For signal output, the correct channel number is defined. A/D counts are acquired and displayed until the user presses the ESCape key. For the scanning function, the user initiates the scan operation by pressing the carriage return. A CALL 7[1] starts the scanning mechanism and acquires a pair of transmittance/wavelength signals every two seconds. (This time interval is programable.) The difference (D) between starting and ending wavelength signals is evaluated and an appropriate message issued based on the following criteria:

D < -10 A/D counts for proper scan;
D > -10 A/D counts and D < 10 A/D counts for no scan;
D > 10 A/D counts for scan in wrong direction;

where D is the A/D count at the end of the scan less the A/D count at the beginning of the scan.

Whether or not the user employs this channel-check facility, a mandatory check of the transmittance and wavelength signals is made. The signals must each be in the range of 500 to 15000 A/D counts in order to avoid a compulsory return to master command level. (The range of the digital counts from the A/D converter is zero to 16383 counts.)

Parameters are retrieved from the wavelength calibration file UVV00.CF. If the file doesn't exist, the program makes the user choose to calibrate wavelength or end the session. Given that the file is in proper order, the user selects one of three options: 1) check wavelength calibration; 2) calibrate wavelength; or 3) continue the run.

Wavelength Calibration Checking and Setting --

In checking the calibration, the program instructs the user to position the wavelength dial, enter the wavelength value, and press the carriage return. An A/D count is taken from the wavelength channel, and converted to the wavelength value. The expected and measured wavelengths and their differences are displayed. The process continues until an ESCape sends control back to the wavelength calibration options.

To calibrate, the module tells the user to select increments of 50 or 100 nanometers, and one to three readings per setting. A prompt is displayed for each setting. When the user presses the carriage return, eight wavelength A/D counts are acquired and averaged by a CALL 6[1], and stored. When all A/D counts have been received, the calibration curve is computed by quadratic regression along with the actual and percent relative standard errors of estimate. The old and new equations are displayed. The program queries the user about possible rejection of the new results. Should the results not be rejected, they are stored in the file UVV00.CF. Program flow then returns to the wavelength calibration options.

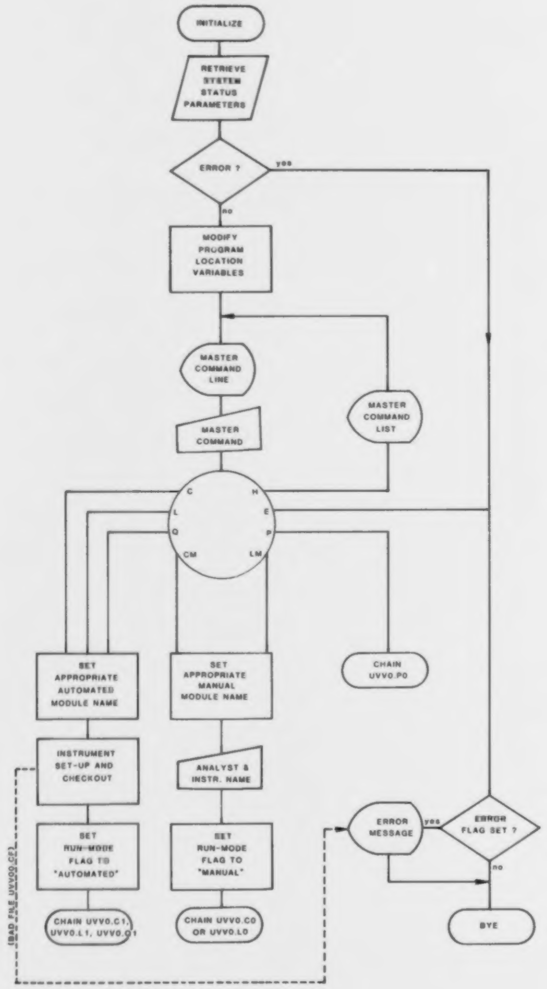
INITIALIZE
RETRIEVE SYSTEM STATUS PARAMETERS
ERROR ?
yes
no
MODIFY PROGRAM LOCATION VARIABLES
MASTER COMMAND LINE
MASTER COMMAND LIST
MASTER COMMAND
C
L
Q
CM
H
E
P
LM
SET APPROPRIATE AUTOMATED MODULE NAME
SET APPROPRIATE MANUAL MODULE NAME
CHAIN UVV0.P0
INSTRUMENT SET-UP AND CHECKOUT
ANALYST & INSTR. NAME
SET RUN-MODE FLAG TO "AUTOMATED"
SET RUN-MODE FLAG TO "MANUAL"
ERROR MESSAGE
yes
ERROR FLAG SET ?
no
CHAIN UVV0.C1, UVV0.L1, UVV0.Q1
CHAIN UVV0.C0 OR UVV0.L0
BYE
(BAD FILE UVV00.CF)

Figure 2. Flowchart of module UVV0.00.

TABLE 1. VARIABLE DESCRIPTIONS FOR MODULE UVV0.00

A$	a single-character user-response variable
A0$	the master command
A2	an accumulator used by CALL 257
A5	the A/D count from CALL 5
A6	the averaged A/D count from CALL 6
C0$	the master command line
C2	the CALL 257 indicator number for scan-clear (i.e. stop)
C3$	the command line for the channel output/function test segment
C5	the transmittance signal channel number
C6	the wavelength signal channel number
C7	the CALL 7 channel-indicator number
C8	a channel number variable used by CALL 5
C()	a matrix used in the quadratic regression of the wavelength calibration equation
D$	an output variable in the channel signal display
D0	the direction of data collection in wavelength calibration
D1	the CALL 1 time delay (in sixtieth seconds)
D7	The CALL 7 initial time delay (in sixtieth seconds)
D8	the CALL 7 between-signal pairs time delay (in sixtieth sec.)
E0	the standard error of estimate (SEE) of the new wavelength calibration equation
E1	the percent relative SEE of the new wavelength calibration equation
E2	the SEE of the existent wavelength calibration equation
E3	the percent relative SEE of the existent wavelength calibration equation
E5	the absolute value difference between expected and computed wavelength in computing the standard error of estimate
F0	the run-mode flag, where: F0 = 0 for no run-mode F0 = 1 for automated run F0 = 2 for manual run
F0$	a file name variable
F1	the error flag, where: F1 = 0 for no error F1 = 1 for error in analysis or plot module F1 = 2 for error in master control module
F1$, F2$, F3$	program location file names

TABLE 1 (continued)

	F1$ "previous" program F2$ "present" program F3$ "destination" program
F2	the results flag for the subroutine to examine/set analyst and instrument names, where: F2 = 0 for completed subroutine function F2 = 1 for escape during subroutine
F3	the flag for existence of wavelength calibration data, where: F3 = 0 for existent wavelength calibration data F3 = 1 for no existent wavelength calibration data
F4	the flag for mandatory channel check, where: F4 = 1 for transmittance signal out of bounds F4 = 2 for wavelength signal out of bounds F4 = 3 for both signals out of bounds F4 = 0 for neither signal out of bounds
F5	a flag used during program initialization
I	a loop-counter and general-purpose variable
I0	the wavelength calibration increment (50 or 100 nm.)
J, K, K1, L	loop-counter and general-purpose variables
N0	the total number of points collected in wavelength calibration
N1$	the analyst's name
N2$	the instrument type
N3$	an input character string used to approve/change names
N6	the number of A/D counts to be acquired and averaged in a CALL 6
N7	the number of A/D counts to be acquired and stored by the CALL 7
O$	an output variable for the mandatory channel check
P	a branching variable
Q1, Q2, Q3	the constants of the wavelength calibration equation
R0	the number of readings per setting in wavelength calibration
R0$	an output variable in the wavelength calibration segment
S0	the starting wavelength of a set of readings in the wavelength calibration segment
S1, S2, S3, S4	the month, day, hour, and minute of a program or system error
S1$, S2$	output format strings used in the wavelength calibration segment
T0, T1	general-purpose variables

TABLE 1 (continued)

VO()	the CALL 7 storage array
W	a general-purpose variable representing wavelength
W5	the measured and computed wavelength
ZO	a general-purpose variable
Z()	a matrix of collected A/D counts in the wavelength calibration segment

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE  1
                       PROGRAM LISTING FOR UVV0.00

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0010 REM          ++++++++++++++++++++++++++++++++++++++++
0020 REM          +    AUTOMATED  ULTRAVIOLET-VISIBLE    +
0030 REM          +       SPECTROPHOTOMETER SYSTEM       +
0040 REM          +    MASTER CONTROL MODULE: UVV0.00    +
0050 REM          +    WRITTEN BY GREG ROTH (3/11/80)    +
0060 REM          +    UNIV. OF CINCI. COMPUTER CENTER   +
0070 REM          ++++++++++++++++++++++++++++++++++++++++
0080 REM
0090 REM
0100 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0110 REM                   INITIALIZATION SEGMENT
0120 REM
0130 REM ----------  SET PAGE/ESC/ROUTE-FLAG
0140 PAGE =72
0150 ON ESC THEN GOTO 0240
0160 LET F5=0
0170 ESC
0180 REM ---------- DIM/INIT STRING VARS. --- ANSWERS, FILES, NAMES
0190 DIM A$[1],A0$[2],C0$[16]
0200 LET C0$="C L Q CMLMP E H "
0210 DIM F0$[13],F1$[13],F2$[13],F3$[13]
0220 DIM N1$[20],N2$[20],N3$[20]
0230 REM ----------  ESCAPE DURING PROGRAM INITIALIZATION
0240 NOESC
0250 CLOSE
0260 DIM F0$[13],F1$[13],F2$[13],F3$[13]
0270 LET F5=1
0280 REM ---------- RETRIEVE/INIT SYSTEM STATUS VARS.
0290 LET F0$="UVV00.TR"
0300 ON ERR THEN GOTO 0440
0310 OPEN FILE[0,0],F0$,21
0320 READ FILE[0,0],F0,F1
0330 READ FILE[0,1],F1$
0340 READ FILE[0,2],F2$
0350 READ FILE[0,3],F3$
0360 READ FILE[0,4],N1$
0370 READ FILE[0,5],N2$
0380 READ FILE[0,6],C5,C6,C7
0390 CLOSE FILE[0]
0400 ON ERR THEN STOP
0410 IF F0=0 THEN LET F1=0
0420 GOTO 0480

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE  2
                       PROGRAM LISTING FOR UVV0.00

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0430 REM   [ERROR IN SYSTEM STATUS FILE]
0440 NOESC
0450 CLOSE
0460 LET F1=2
0470 REM   [MODIFY PROGRAM LOCATION VARIABLES]
0480 LET F1$=F2$
0490 LET F2$=F3$
0500 LET F3$=F1$
0510 IF F1>0 THEN GOTO 5760
0520 GOTO 0690
0530 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0540 REM                    MASTER COMMAND LEVEL (MCL)
0550 REM
0560 REM ----------  MCL COMMAND LIST
0570 ON ESC THEN GOTO 0690
0580 ON ERR THEN STOP
0590 PRINT
0600 PRINT "C  ---  CHLOROPHYLL ANALYSIS (AUTOMATED)"
0610 PRINT "L  ---  COLOR ANALYSIS (AUTOMATED)"
0620 PRINT "Q  ---  QUALITY ASSURANCE FILTER TEST OF SPECTROPHOTOMETER
*   "
0630 PRINT "CM ---  CHLOROPHYLL ANALYSIS (MANUAL DATA-ENTRY)"
0640 PRINT "LM ---  COLOR ANALYSIS (MANUAL DATA-ENTRY)"
0650 PRINT "P  ---  PLOTS OF AUTOMATED ANALYSIS SCANS"
0660 PRINT "E  ---  END OF UVVIS SESSION"
0670 PRINT "H  ---  HELP"
0680 REM ----------  MCL COMMAND SELECT
0690 ON ESC THEN GOTO 0690
0700 ESC
0710 ON ERR THEN GOTO 0830
0720 PRINT
0730 PRINT
0740 PRINT "MASTER COMMANDS:  ";
0750 INPUT "C, L, Q, CM, LM, P, E, H(CR)  >>> ",A0$
0760 ON ERR THEN STOP
0770 IF LEN(A0$)=0 THEN LET A0$="H "
0780 IF LEN(A0$)=2 THEN IF A0$[1,1]=" " THEN LET A0$=A0$[2,2]
0790 IF LEN(A0$)=1 THEN LET A0$=A0$," "
0800 LET P=(POS(C0$,A0$,1)+1)/2
0810 IF P<>INT(P) THEN GOTO 0830
0820 ON P THEN GOTO 0910, 0910, 0910, 5580, 5580, 5710, 5760, 0570
0830 ON ERR THEN STOP

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVV0.00

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0840 PRINT "<7>"
0850 PRINT "INVALID COMMAND. <7>"
0860 GOTO 0710
0870 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0880 REM                    AUTOMATED ANALYSIS SEGMENT
0890 REM
0900 REM ---------- AUT'D ANALYSIS PREP SECTION
0910 ON ESC THEN GOTO 0690
0920 LET F3$="UVV0.",A0$[1,1],"1"
0930 ON ERR THEN GOTO 1000
0940 LET C2=24823
0950 LET A2=0
0960 CALL 257,C2,A2
0970 ON ERR THEN STOP
0980 IF F0=1 THEN GOTO 1370
0990 GOTO 1070
1000 NOESC
1010 ON ERR THEN STOP
1020 LET F1=2
1030 PRINT "<7>"
1040 PRINT "ERROR IN CALL 257; SYS(7) =";SYS(7)
1050 GOTO 5760
1060 REM   [EXAMINE/SET ANALYST & INST. NAMES]
1070 ON ERR THEN STOP
1080 LET F2=1
1090 GOSUB 6200
1100 ON ESC THEN GOTO 0690
1110 IF F2=1 THEN GOTO 0690
1120 REM ---------- DISPLAY SET-UP INSTR'S. (1ST TIME; OPTIONAL)
1130 ON ERR THEN GOTO 1130
1140 PRINT
1150 INPUT "LIST SET-UP INSTRUCTIONS ?  [N(CR) OR Y]  >>> ",A$
1160 ON ERR THEN STOP
1170 IF LEN(A$)=0 THEN GOTO 1370
1180 IF A$="N" THEN GOTO 1370
1190 IF A$<>"Y" THEN GOTO 1130
1200 PRINT
1210 PRINT "1.  TURN ON POWER UNIT."
1220 PRINT "2.  TURN ON INSTRUMENT-COMPUTER INTERFACE."
1230 PRINT "3.  TURN ON SPECTROPHOTOMETER (INCLUDING LAMP)."
1240 PRINT "4.  SET SPECTRO. FOR NO-SCAN AND FOR TRANSMITTANCE."
1250 PRINT "5.  ";

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVV0.00

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
1260 ON ERR THEN GOTO 1310
1270 TIME =90
1280 TINPUT "PRESS CR KEY TO CONTINUE.",A$
1290 ON ERR THEN STOP
1300 IF LEN(A$)=0 THEN GOTO 1370
1310 ON ERR THEN STOP
1320 PRINT "<7>"
1330 IF SYS(14)=0 THEN GOTO 0690
1340 PRINT  TAB(4);
1350 GOTO 1260
1360 REM ---------- TEST CHANNELS OUTPUT/FUNCTION (OPTIONAL)
1370 ON ESC THEN GOTO 0690
1380 ESC
1390 ON ERR THEN GOTO 1460
1400 PRINT
1410 INPUT "TEST CHANNEL OUTPUTS/FUNCTION ?  [N(CR) OR Y]  >>>  ",A$
1420 ON ERR THEN STOP
1430 IF LEN(A$)=0 THEN GOTO 2480
1440 IF A$="N" THEN GOTO 2480
1450 IF A$="Y" THEN GOTO 1500
1460 ON ERR THEN STOP
1470 PRINT "<7>"
1480 GOTO 1390
1490 REM   [DIM/INIT CHANNEL-CHECK VARS.]
1500 DIM C3$[4],D$[1]
1510 LET C3$="TWSE"
1520 LET D1=20
1530 LET C8=0
1540 LET A5=0
1550 LET N7=8
1560 DIM V0[N7]
1570 LET D7=0
1580 LET D8=120
1590 REM   [RETRIEVE CHANNEL-CHECK COMMAND]
1600 ON ESC THEN GOTO 0690
1610 ON ERR THEN GOTO 1700
1620 PRINT
1630 PRINT
1640 PRINT "CHANNEL CHECKS: TRANSMITTANCE[T], WAVELENGTH[W],"
1650 INPUT "                SCANNING[S], END CHECKING[E(CR)]  >>> ",A$
1660 ON ERR THEN STOP
1670 IF LEN(A$)=0 THEN LET A$="E"

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
1680 LET P=POS(C3$,A$,1)
1690 ON P THEN GOTO 1750, 1750, 2020, 2480
1700 ON ERR THEN STOP
1710 PRINT
1720 PRINT "<7> INVALID RESPONSE"
1730 GOTO 1610
1740 REM   [RETRIEVE/DISPLAY CHANNEL SIGNAL]
1750 ON ESC THEN GOTO 1600
1760 IF A$="T" THEN LET C8=C5
1770 IF A$="W" THEN LET C8=C6
1780 PRINT
1790 PRINT "PRESS ESCAPE KEY TO END SIGNAL DISPLAY."
1800 PRINT "('H' --- A/D COUNT ABOVE 15500 LIMIT; ";
1810 PRINT "'L' --- BELOW 500 LIMIT)"
1820 PRINT  TAB(0);
1830 FOR I=1 TO 6
1840   ON ERR THEN GOTO 1960
1850   CALL 1,D1
1860   CALL 5,C8,A5
1870   ON ERR THEN STOP
1880   LET D$=" "
1890   IF A5>=500 THEN IF A5<=15500 THEN GOTO 1930
1900   IF A5<500 THEN LET D$="L"
1910   IF A5>15500 THEN LET D$="H"
1920   PRINT "<7>";
1930   PRINT USING " ##### #   ",A5,D$;
1940 NEXT I
1950 GOTO 1820
1960 NOESC
1970 LET F1=2
1980 PRINT
1990 PRINT "ERROR IN CALLS 1 OR 5; SYS(7) =";SYS(7)
2000 GOTO 5760
2010 REM   [CHECK CALL 7 SCAN FUNCTION]
2020 ON ESC THEN GOTO 1600
2030 ON ERR THEN GOTO 2030
2040 PRINT
2050 PRINT "SET WAVELENGTH AT 550 NANOMETERS;"
2060 PRINT "SET SPECTRO. FOR SCAN OPERATION AND ";
2070 INPUT "PRESS CR KEY. ",A$
2080 ON ERR THEN STOP
2090 IF LEN(A$)=0 THEN GOTO 2120

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2100 PRINT "<7>"
2110 GOTO 2030
2120 ON ESC THEN GOTO 2190
2130 ON ERR THEN GOTO 2230
2140 CALL 7,C7,D7,D8,N7,V0[1]
2150 ON ESC THEN GOTO 1600
2160 ON ERR THEN STOP
2170 GOTO 2310
2180 REM  [EXIT FROM CALL 7]
2190 ON ERR THEN GOTO 1000
2200 CALL 257,C2,A2
2210 GOTO 2150
2220 REM  [ERROR IN CALL 7]
2230 ON ERR THEN GOTO 1000
2240 CALL 257,C2,A2
2250 ON ERR THEN STOP
2260 ESC
2270 PRINT
2280 PRINT "ERROR IN CALL 7; SYS(7) =";SYS(7)
2290 LET F1=2
2300 GOTO 5760
2310 PRINT
2320 PRINT "WAVELENGTH SIGNAL CHANGE: ";
2330 PRINT STR$(V0[8]-V0[2]);" A/D COUNTS.";
2340 IF (V0[8]-V0[2])>-10 THEN GOTO 2380
2350 PRINT
2360 PRINT "SCAN O.K."
2370 GOTO 1600
2380 IF (V0[8]-V0[2])>10 THEN GOTO 2430
2390 PRINT "<7>"
2400 PRINT "LITTLE OR NO CHANGE IN WAVELENGTH SIGNAL."
2410 PRINT "(SPECTRO. SET FOR SCAN OPERATION ?)"
2420 GOTO 1600
2430 PRINT "<7>"
2440 PRINT "POSITIVE WAVELENGTH SIGNAL CHANGE."
2450 PRINT "(CORRECT SCAN DIRECTION NOT VERIFIED BY COMPUTER.)"
2460 GOTO 1600
2470 REM ---------- MANDATORY CHANNEL SIGNAL CHECK
2480 NOESC
2490 DIM O$[13]
2500 LET O$="TRANSMITTANCE"
2510 LET A5=0

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
123456789112345678921234567893123456789412345678951234567896123456789 7
         0         0         0         0         0         0         0
2520 LET F4=0
2530 LET C8=C5
2540 GOTO 2570
2550 LET O$="WAVELENGTH"
2560 LET C8=C6
2570 ON ERR THEN GOTO 2730
2580 CALL 5,C8,A5
2590 ON ERR THEN STOP
2600 IF A5>=500 THEN IF A5<=15500 THEN GOTO 2680
2610 IF C8=C5 THEN LET F4=F4+1
2620 IF C8=C6 THEN LET F4=F4+2
2630 PRINT "<7>"
2640 PRINT "MANDATORY CHANNEL CHECK: ";O$;" SIGNAL ";
2650 IF A5<500 THEN PRINT "TOO LOW";
2660 IF A5>15500 THEN PRINT "TOO HIGH";
2670 PRINT " (";STR$(A5);" A/D COUNTS)"
2680 IF C8<>C6 THEN GOTO 2550
2690 IF F4=0 THEN GOTO 2800
2700 PRINT "<7>"
2710 PRINT "CHECK INTERFACE AND ALL SWITCHES."
2720 GOTO 0690
2730 PRINT
2740 PRINT "<7>"
2750 PRINT "ERROR IN CALL 5; SYS(7) =";SYS(7)
2760 LET F1=2
2770 GOTO 5760
2780 REM ---------- CHECK/SET WAVELEN. CALIB. OPT-SELECT
2790 REM   [RETRIEVE WAVELENGTH CALIB. PARM'S]
2800 LET F0$="UVV00.CF"
2810 ON ESC THEN GOTO 0690
2820 ESC
2830 ON ERR THEN GOTO 2910
2840 OPEN FILE[1,0],F0$,20
2850 ON ESC THEN GOTO 3110
2860 READ FILE[1,0],Q1,Q2,Q3,E2,E3
2870 READ FILE[1,1],Q1,Q2,Q3,E2,E3
2880 CLOSE FILE[1]
2890 GOTO 3150
2900 CLOSE FILE[!]
2910 ON ERR THEN STOP
2920 CLOSE
2930 PRINT

123456789112345678921234567893123456789412345678951234567896123456789 7
         0         0         0         0         0         0         0
```

```
123456789112345678921234567893123456789412345678951234567896123456789 7
         0         0         0         0         0         0         0
2940 PRINT "PROBLEM IN WAVELENGTH CALIBRATION DATA FILE; ";
2950 ON ERR THEN GOTO 3060
2960 PRINT
2970 INPUT "CALIBRATE[1] OR END SESSION[2(CR)]  >>> ",A$
2980 ON ERR THEN STOP
2990 ESC
3000 LET F1=2
3010 IF LEN(A$)=0 THEN GOTO 5760
3020 IF A$="2" THEN GOTO 5760
3030 LET F1=0
3040 ESC
3050 IF A$="1" THEN GOTO 3730
3060 ON ERR THEN STOP
3070 PRINT "<7>"
3080 PRINT "PLEASE ENTER 1 OR 2."
3090 GOTO 2950
3100 REM  [ESCAPE WHILE FILE OPEN]
3110 NOESC
3120 CLOSE FILE[1]
3130 GOTO 0690
3140 REM ---------- CHECK/SET WAVELENGTH CALIBRATION (OPTIONAL)
3150 ON ESC THEN GOTO 0690
3160 ON ERR THEN GOTO 3240
3170 PRINT
3180 PRINT "CHECK AND/OR SET WAVELENGTH CALIBRATION ?  ";
3190 INPUT "[N(CR) OR Y]  >>> ",A$
3200 ON ERR THEN STOP
3210 IF LEN(A$)=0 THEN GOTO 5520
3220 IF A$="N" THEN GOTO 5520
3230 IF A$="Y" THEN GOTO 3280
3240 ON ERR THEN STOP
3250 PRINT "<7>"
3260 GOTO 3160
3270 REM ---------- RETRIEVE WAVELEN. CALIB.-CHECK COMMAND
3280 ON ESC THEN GOTO 0690
3290 ON ERR THEN GOTO 3380
3300 PRINT
3310 PRINT
3320 PRINT "WAVELENGTH CALIB.:  ";
3330 INPUT "CHECK[1], CALIBRATE[2], CONTINUE[3(CR)]  >>> ",A$
3340 ON ERR THEN STOP
3350 IF LEN(A$)=0 THEN LET A$="3"

123456789112345678921234567893123456789412345678951234567896123456789 7
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE  9
                    PROGRAM LISTING FOR UVV0.00

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
3360 LET P=POS("123",A$,1)
3370 ON P THEN GOTO 3430, 3730, 5520
3380 ON ERR THEN STOP
3390 PRINT "<7>"
3400 PRINT "PLEASE ENTER 1, 2, OR 3."
3410 GOTO 3290
3420 REM   [CHECK WAVELENGTH CALIBRATION]
3430 ON ESC THEN GOTO 3280
3440 PRINT
3450 PRINT "PRESS ESC KEY TO END TESTING."
3460 PRINT
3470 ON ERR THEN GOTO 3470
3480 PRINT
3490 INPUT "SET/ENTER WAVELENGTH AND PRESS CR KEY  >>> ",W
3500 IF W>=200 THEN IF W<=800 THEN GOTO 3540
3510 PRINT
3520 PRINT "<7>WAVELENGTH MUST BE IN RANGE OF 200-800 NANOMETERS."
3530 GOTO 3470
3540 ON ERR THEN GOTO 3660
3550 CALL 5,C6,A5
3560 ON ERR THEN STOP
3570 LET W5=Q1+A5*(Q2+A5*Q3)
3580 LET E5=ABS(W5-W)
3590 PRINT USING "EXPECTED: ###.##  ",W;
3600 PRINT USING "MEAS'D: ###.##  ",W5;
3610 PRINT USING "DIFF: +#.##  CONTROL RAT'G: ",(W5-W);
3620 IF E5<.25 THEN PRINT "IN CONTROL"
3630 IF E5>=.25 THEN IF E5<=.5 THEN PRINT "WARNING"
3640 IF E5>.5 THEN PRINT "OUT OF CTL"
3650 GOTO 3470
3660 NOESC
3670 LET F1=2
3680 PRINT "<7>"
3690 PRINT "ERROR IN CALL 7; SYS(7) =";SYS(7)
3700 GOTO 5760
3710 REM   [CALIBRATE WAVELENGTH]
3720 REM  [DIM/INIT CALIBRATION VARS.]
3730 ON ESC THEN GOTO 3280
3740 DIM Z[11,3],C[3,4],R0$[9],S1$[71],S2$[71]
3750 LET R0$="1ST2ND3RD"
3760 LET N6=8
3770 LET A6=0

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE 10
                    PROGRAM LISTING FOR UVV0.00

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
3780 MAT C=ZER
3790 REM  [SET READING-INCREMENT & #-OF-READINGS]
3800 ON ESC THEN GOTO 3280
3810 ON ERR THEN GOTO 3810
3820 PRINT
3830 PRINT "SELECT SETTING INCREMENT:  ";
3840 INPUT "1)50-NM.   2)100-NM.  >>> ",I0
3850 ON ERR THEN STOP
3860 IF I0=1 THEN GOTO 3910
3870 IF I0=2 THEN GOTO 3910
3880 PRINT
3890 PRINT "<7>PLEASE ENTER 1 OR 2."
3900 GOTO 3810
3910 ON ERR THEN GOTO 3910
3920 PRINT
3930 PRINT "SELECT NUMBER OF READINGS PER SETTING:  ";
3940 INPUT "1, 2, OR 3  >>> ",R0
3950 ON ERR THEN STOP
3960 IF R0>=1 THEN IF R0<=3 THEN IF R0=INT(R0) THEN GOTO 4010
3970 PRINT
3980 PRINT "<7>PLEASE ENTER 1, 2, OR 3."
3990 GOTO 3910
4000 REM  [INIT FOR COLLECT-UP; COLLECT/STORE READINGS]
4010 LET I0=I0*50
4020 LET N0=(500/I0+1)*R0
4030 LET S0=300
4040 LET D0=1
4050 PRINT
4060 PRINT "FOR EACH READING, SET WAVELENGTH AND PRESS CR KEY."
4070 PRINT
4080 FOR I=1 TO R0
4090   PRINT
4100   IF R0>1 THEN PRINT R0$[3*I-2,3*I];" SET OF READINGS."
4110   FOR J=S0 TO (S0+500*D0) STEP (I0*D0)
4120     LET K=(J-300)/I0+1
4130     ON ERR THEN GOTO 4180
4140     PRINT J;
4150     INPUT "NM.  >>> ",A$
4160     ON ERR THEN STOP
4170     IF LEN(A$)=0 THEN GOTO 4210
4180     ON ERR THEN STOP
4190     PRINT "<7>"

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                      PAGE 11
                    PROGRAM LISTING FOR UVV0.00

 1234567891123456789212345678931234567894123456789512345678961234567897
          0         0         0         0         0         0         0
4200      GOTO 4130
4210      ON ERR THEN GOTO 3660
4220      CALL 6,C6,N6,A6
4230      ON ERR THEN STOP
4240      LET Z[K,I]=A6
4250    NEXT J
4260    LET S0=S0+(500*D0)
4270    LET D0=-D0
4280 NEXT I
4290 REM  [COMPUTE RESULTS BY 2ND DEGREE REGRESSION]
4300 FOR I=0 TO (500/I0)
4310   LET W=300+I*I0
4320   FOR J=1 TO R0
4330     LET L=Z[I+1,J]
4340     FOR K=1 TO 3
4350       LET K1=K-1
4360       LET C[1,K]=C[1,K]+L^K1
4370       LET C[K,4]=C[K,4]+(W*L^K1)
4380       IF K>1 THEN LET C[K,3]=C[K,3]+L^(K+1)
4390     NEXT K
4400   NEXT J
4410 NEXT I
4420 FOR I=2 TO 3
4430   FOR J=1 TO 2
4440     LET C[I,J]=C[I-1,J+1]
4450   NEXT J
4460 NEXT I
4470 FOR I=1 TO 3
4480   FOR J=I TO 3
4490     IF C[J,I]<>0 THEN GOTO 4700
4500   NEXT J
4510   ON ESC THEN GOTO 3280
4520   ON ERR THEN STOP
4530   PRINT "<7>"
4540   PRINT "ERROR IN CALIBRATION DATA REDUCTION;"
4550   PRINT "NO UNIQUE SOLUTION TO REGRESSION.<7>"
4560   ON ERR THEN GOTO 4560
4570   PRINT
4580   INPUT "RECALIBRATE[1] OR END SESSION[2(CR)]  >>> ",A$
4590   ON ERR THEN STOP
4600   ESC
4610   LET F1=2

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                      PAGE 12
                    PROGRAM LISTING FOR UVV0.00

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
4620   IF LEN(A$)=0 THEN GOTO 5760
4630   IF A$="2" THEN GOTO 5760
4640   LET F1=0
4650   ESC
4660   IF A$="1" THEN GOTO 3800
4670   PRINT "<7>"
4680   PRINT "PLEASE ENTER 1 OR 2(CR)."
4690   GOTO 4560
4700   FOR K=1 TO 4
4710     LET T0=C[I,K]
4720     LET C[I,K]=C[J,K]
4730     LET C[J,K]=T0
4740   NEXT K
4750   LET Z0=1/C[I,I]
4760   FOR K=1 TO 4
4770     LET C[I,K]=Z0*C[I,K]
4780   NEXT K
4790   FOR J=1 TO 3
4800     IF J=I THEN GOTO 4850
4810     LET Z0=-C[J,I]
4820     FOR K=1 TO 4
4830       LET C[J,K]=C[J,K]+Z0*C[I,K]
4840     NEXT K
4850   NEXT J
4860 NEXT I
4870 REM  [COMPUTE STANDARD ERROR OF ESTIMATE]
4880 LET T0=0
4890 LET T1=0
4900 FOR I=0 TO (500/I0)
4910   LET K=300+I*I0
4920   FOR J=1 TO R0
4930     LET L=Z[I+1,J]
4940     LET T0=T0+K
4950     LET Z0=C[1,4]+C[2,4]*L
4960     LET Z0=Z0+C[3,4]*L*L
4970     LET T1=T1+(K-Z0)^2
4980   NEXT J
4990 NEXT I
5000 LET E0=SQR(T1/(N0-3))
5010 LET E1=E0*100/(T0/N0)
5020 REM  [DISPLAY RESULTS]
5030 REM      GET OLD DATA, IF EXISTENT

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVV0.00

```
123456789112345678921234567893123456789412345678951234567896123456787897
         0          0          0          0          0          0         0
5040 LET F0$="UVV00.CF"
5050 ON ERR THEN GOTO 5110
5060 OPEN FILE[1,0],F0$,20
5070 READ FILE[1,0],Q1,Q2,Q3,E2,E3
5080 READ FILE[1,1],Q1,Q2,Q3,E2,E3
5090 LET F3=0
5100 GOTO 5120
5110 LET F3=1
5120 ON ERR THEN STOP
5130 CLOSE FILE[1]
5140 LET S1$="OLD:    WL  =  -#.###^^^^  #  -#.####^^^^ * SIG"
5150 LET S1$=S1$,"  #  -#.####^^^^ * SIG^2"
5160 LET S2$="          STANDARD ERROR OF ESTIMATE(SEE):"
5170 LET S2$=S2$," -#.##^^^^    REL SEE: ---#.##%"
5180 PRINT
5190 PRINT "WAVELENGTH CALIBRATION EQUATION -----"
5200 PRINT
5210 IF F3=1 THEN GOTO 5250
5220 PRINT USING S1$,Q1,"+",Q2,"+",Q3
5230 PRINT USING S2$,E2,E3
5240 PRINT
5250 LET S1$[1,3]="NEW"
5260 PRINT USING S1$,C[1,4],"+",C[2,4],"+",C[3,4]
5270 PRINT USING S2$,E0,E1
5280 REM  [OPTIONAL DATA STORAGE]
5290 ON ERR THEN GOTO 5360
5300 PRINT
5310 INPUT "REJECT NEW CALIBRATION RESULTS ? [N(CR) OR Y]  >>> ",A$
5320 ON ERR THEN STOP
5330 IF LEN(A$)=0 THEN GOTO 5390
5340 IF A$="N" THEN GOTO 5390
5350 IF A$="Y" THEN GOTO 3280
5360 ON ERR THEN STOP
5370 PRINT "<7>"
5380 GOTO 5290
5390 OPEN FILE[1,0],F0$,20
5400 WRITE FILE[1,0],SYS(2),SYS(1),SYS(3)
5410 WRITE FILE[1,1],C[1,4],C[2,4],C[3,4],E0,E1
5420 CLOSE FILE[1]
5430 LET Q1=C[1,4]
5440 LET Q2=C[2,4]
5450 LET Q3=C[3,4]

123456789112345678921234567893123456789412345678951234567896123456787897
         0          0          0          0          0          0         0
```

PROGRAM LISTING FOR UVV0.00

```
123456789112345678921234567893123456789412345678951234567896123456787897
         0          0          0          0          0          0         0
5460 LET E2=E0
5470 LET E3=E1
5480 PRINT
5490 PRINT "CALIBRATION DATA AND DATE STORED."
5500 GOTO 3280
5510 REM ---------- SET RUN-MODE FLAG TO "AUTOMATED"
5520 LET F0=1
5530 GOTO 5940
5540 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
5550 REM              MANUAL DATA-ENTRY ANALYSIS SEGMENT
5560 REM
5570 REM
5580 ON ESC THEN GOTO 0690
5590 LET F3$="UVV0.",A0$[1,1],"0"
5600 REM ---------- EXAMINE/SET ANALYST & INST. NAMES
5610 LET F2=1
5620 GOSUB 6200
5630 ON ESC THEN GOTO 0690
5640 IF F2=1 THEN GOTO 0690
5650 REM ---------- SET RUN-MODE FLAG TO "MANUAL"
5660 LET F0=2
5670 GOTO 5940
5680 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
5690 REM                   PLOT OPTION SEGMENT (PREP)
5700 REM
5710 LET F3$="UVV0.P0"
5720 GOTO 5940
5730 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
5740 REM                EXIT OPTION AND ERROR-EXIT SEGMENT
5750 REM
5760 ON ESC THEN GOTO 0690
5770 ON ERR THEN STOP
5780 IF F1=0 THEN GOTO 5890
5790 ESC
5800 REM ---------- IF F1=2, ERROR OCCURRED IN UVVIS MASTER CONTROLLER
5810 IF F1=2 THEN GOTO 5860
5820 REM ---------- IF F1=1, ERROR OCCURED IN UVVIS ANALYSIS/PLOT MOD.
5830 PRINT "<7>"
5840 PRINT "UNRECOVERABLE ERROR IN UVVIS ANALYSIS OR PLOT MODULE;"
5850 GOTO 5880
5860 PRINT "<7>"
5870 PRINT "UNRECOVERABLE ERROR IN UVVIS MASTER CONTROLLER MODULE;"

123456789112345678921234567893123456789412345678951234567896123456787897
         0          0          0          0          0          0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                       PAGE 15
                    PROGRAM LISTING FOR UVV0.00

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
5880 PRINT "FORCED END OF SESSION. <7>"
5890 LET F0=0
5900 LET F3$="INITIALIZE"
5910 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
5920 REM     BRANCH POINT: MASTER CONTROLLER TO MODULE/INITIALIZE
5930 REM
5940 NOESC
5950 ON ERR THEN STOP
5960 LET F0$="UVV00.TR"
5970 OPEN FILE[0,0],F0$,21
5980 WRITE FILE[0,0],F0,F1
5990 WRITE FILE[0,1],F1$
6000 IF F3$<>"INITIALIZE" THEN GOTO 6030
6010 LET F2$=F3$
6020 LET F3$="UVV0.00"
6030 WRITE FILE[0,2],F2$
6040 WRITE FILE[0,3],F3$
6050 WRITE FILE[0,4],N1$
6060 WRITE FILE[0,5],N2$
6070 IF F1<>2 THEN GOTO 6130
6080 LET S1=SYS(2)
6090 LET S2=SYS(1)
6100 LET S3=SYS(11)
6110 LET S4=SYS(12)
6120 WRITE FILE[0,7],S1,S2,S3,S4,SYS(7)
6130 CLOSE FILE[0]
6140 NOESC
6150 IF F3$<>"UVV0.00" THEN CHAIN F3$
6160 BYE
6170 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
6180 REM          SUBRT. TO EXAMINE/SET ANALYST & INST. NAMES
6190 REM
6200 ON ESC THEN RETURN
6210 PRINT
6220 ON ERR THEN GOTO 6290
6230 PRINT "ANALYST'S NAME:  ";N1$
6240 INPUT "     [KEEP(CR) OR CHANGE]  >>> ",N3$
6250 ON ERR THEN STOP
6260 IF LEN(N3$)=0 THEN GOTO 6320
6270 LET N1$=N3$
6280 GOTO 6220
6290 ON ERR THEN STOP

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                       PAGE 16
                    PROGRAM LISTING FOR UVV0.00

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
6300 PRINT "<7>"
6310 GOTO 6220
6320 ON ERR THEN GOTO 6410
6330 PRINT "INSTRUMENT TYPE:  ";N2$
6340 INPUT "     [KEEP(CR) OR CHANGE]  >>> ",N3$
6350 ON ERR THEN STOP
6360 IF LEN(N3$)>0 THEN GOTO 6390
6370 LET F2=0
6380 RETURN
6390 LET N2$=N3$
6400 GOTO 6320
6410 ON ERR THEN STOP
6420 PRINT "<7>"
6430 GOTO 6320

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE 17
                        SYMBOL TABLE FOR UVV0.00

SYMBOL    REFERENCES
------  ------------------------------------------------------------------
 0240   0150
 0440   0300
 0480   0420
 0570   0820
 0690   0520  0570  0690  0910  1100  1110  1330  1370  1600  2720
        2810  3130  3150  3280  5580  5630  5640  5760
 0710   0860
 0830   0710  0810
 0910   0820
 1000   0930  2190  2230
 1070   0990
 1130   1130  1190
 1260   1350
 1310   1260
 1370   0980  1170  1180  1300
 1390   1480
 1460   1390
 1500   1450
 1600   1750  2020  2150  2370  2420  2460
 1610   1730
 1700   1610
 1750   1690
 1820   1950
 1930   1890
 1960   1840
 2020   1690
 2030   2030  2110
 2120   2090
 2150   2210
 2190   2120
 2230   2130
 2310   2170
 2380   2340
 2430   2380
 2480   1430  1440  1690
 2550   2680
 2570   2540
 2680   2600
 2730   2570
 2800   2690
 2910   2830
 2950   3090
 3060   2950
 3110   2850
 3150   2890
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE 18
                        SYMBOL TABLE FOR UVV0.00

SYMBOL    REFERENCES
------  ------------------------------------------------------------------
 3160   3260
 3240   3160
 3280   3230  3430  3730  3800  4510  5350  5500
 3290   3410
 3380   3290
 3430   3370
 3470   3470  3530  3650
 3540   3500
 3660   3540  4210
 3730   3050  3370
 3800   4660
 3810   3810  3900
 3910   3860  3870  3910  3990
 4010   3960
 4130   4200
 4180   4130
 4210   4170
 4560   4560  4690
 4700   4490
 4850   4800
 5110   5050
 5120   5100
 5250   5210
 5290   5380
 5360   5290
 5390   5330  5340
 5520   3210  3220  3370
 5580   0820
 5710   0820
 5760   0510  0820  1050  2000  2300  2770  3010  3020  3700  4620
        4630
 5860   5810
 5880   5850
 5890   5780
 5940   5530  5670  5720
 6030   6000
 6130   6070
 6200   1090  5620
 6220   6280  6310
 6290   6220
 6320   6260  6400  6430
 6390   6360
 6410   6320
 A$     0190  1150  1170  1180  1190  1280  1300  1410  1430  1440
        1450  1650  1670  1680  1760  1770  2070  2090  2970  3010
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE 19
                      SYMBOL TABLE FOR UVV0.00

SYMBOL   REFERENCES
------   ------------------------------------------------------------
         3020  3050  3190  3210  3220  3230  3330  3350  3360  4150
         4170  4580  4620  4630  4660  5310  5330  5340  5350
 A0$     0190  0750  0770  0780  0790  0800  0920  5590
 A2      0950  0960  2200  2240
 A5      1540  1860  1890  1900  1910  1930  2510  2580  2600  2650
         2660  2670  3550  3570
 A6      3770  4220  4240
 C       3780
 C0$     0190  0200  0800
 C2      0940  0960  2200  2240
 C3$     1500  1510  1680
 C5      0380  1760  2530  2610
 C6      0380  1770  2560  2620  2680  3550  4220
 C7      0380  2140
 C8      1530  1760  1770  1860  2530  2560  2580  2610  2620  2680
 C[      3740  4360  4370  4380  4440  4490  4710  4720  4730  4750
         4770  4810  4830  4950  4960  5260  5410  5430  5440  5450
 D$      1500  1880  1900  1910  1930
 D0      4040  4110  4260  4270
 D1      1520  1850
 D7      1570  2140
 D8      1580  2140
 E0      5000  5010  5270  5410  5460
 E1      5010  5270  5410  5470
 E2      2860  2870  5070  5080  5230  5460
 E3      2860  2870  5070  5080  5230  5470
 E5      3580  3620  3630  3640
 F0      0320  0410  0980  5520  5660  5890  5980
 F0$     0210  0260  0290  0310  2800  2840  5040  5060  5390  5960
         5970
 F1      0320  0410  0460  0510  1020  1970  2290  2760  3000  3030
         3670  4610  4640  5780  5810  5980  6070
 F1$     0210  0260  0330  0480  0500  5990
 F2      1080  1110  5610  5640  6370
 F2$     0210  0260  0340  0480  0490  6010  6030
 F3      5090  5110  5210
 F3$     0210  0260  0350  0490  0500  0920  5590  5710  5900  6000
         6010  6020  6040  6150
 F4      2520  2610  2620  2690
 F5      0160  0270
 FL#0    0310  0320  0330  0340  0350  0360  0370  0380  0390  5970
         5980  5990  6030  6040  6050  6060  6120  6130
 FL#1    2840  2860  2870  2880  2900  3120  5060  5070  5080  5130
         5390  5400  5410  5420
 I       1830  1940  4080  4100  4240  4280  4300  4310  4330  4410
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE 20
                      SYMBOL TABLE FOR UVV0.00

SYMBOL   REFERENCES
------   ------------------------------------------------------------
         4420  4440  4460  4470  4480  4490  4710  4720  4750  4770
         4800  4810  4830  4860  4900  4910  4930  4990
 I0      3840  3860  3870  4010  4020  4110  4120  4300  4310  4900
         4910
 J       4110  4120  4140  4250  4320  4330  4400  4430  4440  4450
         4480  4490  4500  4720  4730  4790  4800  4810  4830  4850
         4920  4930  4980
 K       4120  4240  4340  4350  4360  4370  4380  4390  4700  4710
         4720  4730  4740  4760  4770  4780  4820  4830  4840  4910
         4940  4970
 K1      4350  4360  4370
 L       4330  4360  4370  4380  4930  4950  4960
 N0      4020  5000  5010
 N1$     0220  0360  6050  6230  6270
 N2$     0220  0370  6060  6330  6390
 N3$     0220  6240  6260  6270  6340  6360  6390
 N6      3760  4220
 N7      1550  1560  2140
 O$      2490  2500  2550  2640
 P       0800  0810  0820  1680  1690  3360  3370
 Q1      2860  2870  3570  5070  5080  5220  5430
 Q2      2860  2870  3570  5070  5080  5220  5440
 Q3      2860  2870  3570  5070  5080  5220  5450
 R0      3940  3960  4020  4080  4100  4320  4920
 R0$     3740  3750  4100
 S0      4030  4110  4260
 S1      6080  6120
 S1$     3740  5140  5150  5220  5250  5260
 S2      6090  6120
 S2$     3740  5160  5170  5230  5270
 S3      6100  6120
 S4      6110  6120
 T0      4710  4730  4880  4940  5010
 T1      4890  4970  5000
 V0[     1560  2140  2330  2340  2380
 W       3490  3500  3580  3590  3610  4310  4370
 W5      3570  3580  3600  3610
 Z0      4750  4770  4810  4830  4950  4960  4970
 Z[      3740  4240  4330  4930
```

SYSTEM STATUS TRANSFER FILE STRUCTURE

The system status transfer file maintains data which are pertinent to all modules within the UVVIS system. It must be initialized before the system can be properly used.

TABLE 2. STRUCTURE OF THE SYSTEM STATUS TRANSFER FILE

File name: UVV00.TR
File type: fixed-length binary random access
Record length: 21 bytes
File number: 0

Record	File Content
0	F0,F1
1	F1$
2	F2$
3	F3$
4	N1$
5	N2$
6	C5,C6,C7
7	S1,S2,S3,S4,E

Where:

F0,F1 are run-mode and error flags
F1$,F2$,F3$ are program location variables (explained in Table 1)
N1$ is analyst's name
N2$ is instrument type
C5,C6 are transmittance and wavelength signal channel numbers, respectively
C7 is CALL 7 channel-indicator number
S1-S4 are month, day, hour, and minute of a UVVIS system error
E is system error code: SYS(7)

WAVELENGTH CALIBRATION FILE STRUCTURE

The wavelength calibration file is used by all modules which employ automated functions.

TABLE 3. STRUCTURE OF THE WAVELENGTH CALIBRATION FILE

File name: UVV00.CF
File type: fixed-length binary random access
Record length: 20 bytes
File number: 1

Record	File Content
0	D1,D2,D3
1	Q1,Q2,Q3,E0,E1

Where:

D1,D2,D3 are month, day, and year of last wavelength calibration
Q1,Q2,Q3 are first, second, and third degree constants of the equation
E0,E1 are actual and percent relative standard errors of estimate

SECTION 3

TRANSMITTANCE CALIBRATION CHECKING/SETTING ROUTINE

All automated analyses require the calibration of transmittance. Because the different analyses use various sample reference media, such as air, distilled water, or reagent, each type of analysis must develop its own transmittance calibration file.

AUTOMATED ANALYSIS TRANSMITTANCE CALIBRATION MODULE -- UVVO.TO

UVVO.TO can be chained to from any of the main automated analysis modules UVVO.C1, UVVO.L1, or UVVO.Q1. (See Figure 3.)

All necessary parameters are retrieved from the proper files. If a transmittance calibration has not been performed for a particular analysis, then a flag is set.

The approximate mid-point of the scan range is computed, and the user is instructed to zero the tramsittance meter at this wavelength. The module then gives the user three options: 1) check the calibration; 2) calibrate; and 3) continue with the analysis, that is, return to the main analysis module). Transmittance data must exist for the check to be made.

To check the calibration, the program directs the user to set the wavelength dial and press the carriage return. The average of five wavelength signal A/D counts is required by means of a CALL 6, and the wavelength value is computed. If this value is within the bounds of the scan range, a similar CALL 6 is made for the transmittance signal. Percent transmittance is calculated by interpolation between the zero and 100 percent transmittance signal values at the set wavelength. This result is displayed. The process repeats until the ESCape key is pressed.

To calibrate, scans at zero percent and 100 percent transmittance are made. Consult the section on the Data Acquisition/Reduction subroutine for more details. Should an escape be made before the completion of the scan, the program provides options to recalibrate, scan again, or again offer the transmittance calibration option line. The data from the zero percent scan are smoothed to remove signal noise. With the calibration thus completed, the program allows the user to accept the scan data, in which case they are stored in the appropriate transmittance calibration file.

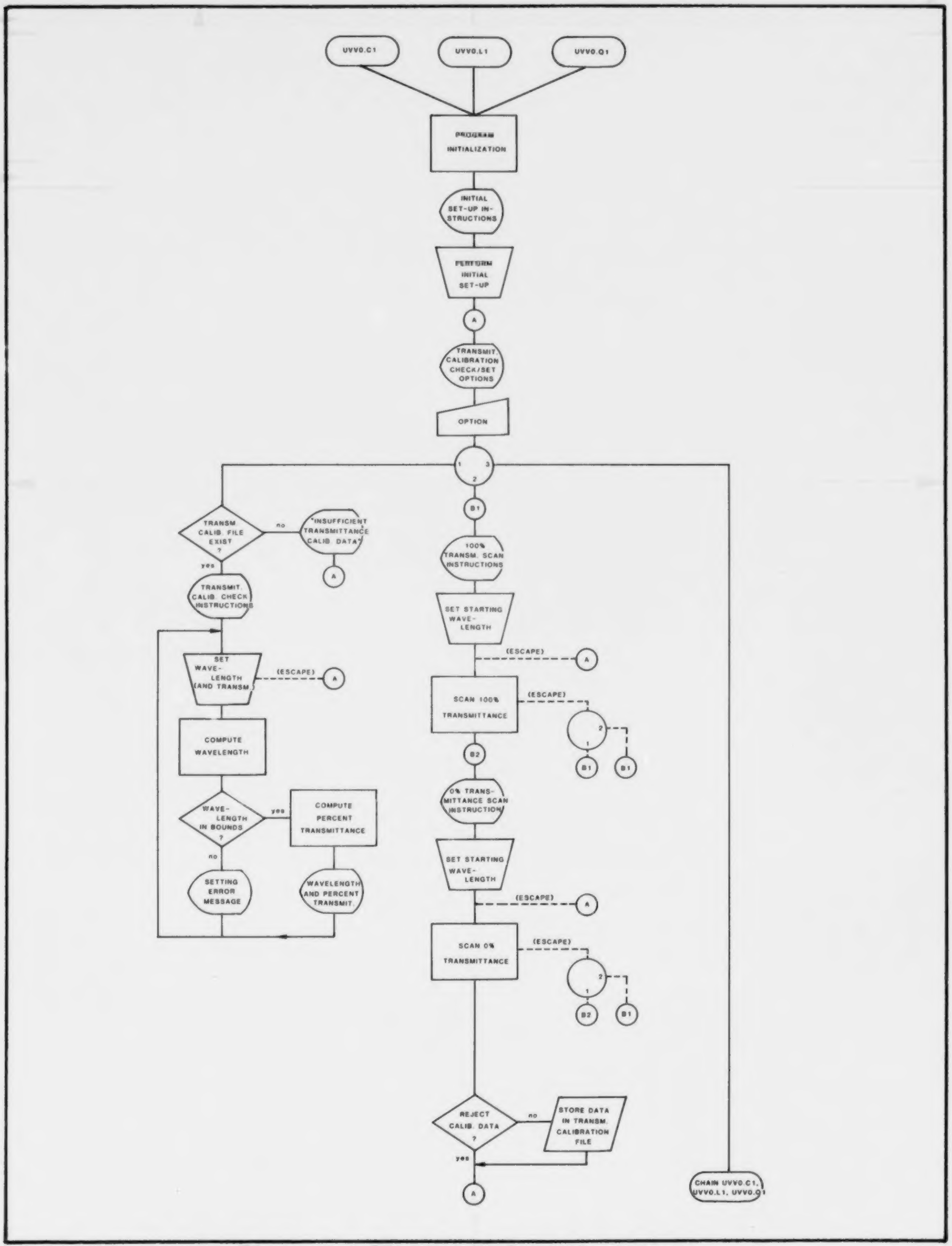
UVV0.C1
UVV0.L1
UVV0.Q1
PROGRAM INITIALIZATION
INITIAL SET-UP INSTRUCTIONS
PERFORM INITIAL SET-UP
A
TRANSMIT CALIBRATION CHECK/SET OPTIONS
OPTION
1
2
3
TRANSM CALIB. FILE EXIST ?
no
"INSUFFICIENT TRANSMITTANCE CALIB. DATA"
A
yes
TRANSMIT CALIB. CHECK INSTRUCTIONS
SET WAVE-LENGTH (AND TRANSM)
(ESCAPE)
A
COMPUTE WAVELENGTH
WAVE-LENGTH IN BOUNDS ?
yes
COMPUTE PERCENT TRANSMITTANCE
no
SETTING ERROR MESSAGE
WAVELENGTH AND PERCENT TRANSMIT
B1
100% TRANSM. SCAN INSTRUCTIONS
SET STARTING WAVE-LENGTH
(ESCAPE)
A
SCAN 100% TRANSMITTANCE
(ESCAPE)
2
1
B1
B1
B2
0% TRANSMITTANCE SCAN INSTRUCTION
SET STARTING WAVE-LENGTH
(ESCAPE)
A
SCAN 0% TRANSMITTANCE
(ESCAPE)
2
1
B2
B1
REJECT CALIB. DATA ?
no
STORE DATA IN TRANSM. CALIBRATION FILE
yes
A
CHAIN UVV0.C1, UVV0.L1, UVV0.Q1

Figure 3. Flowchart of module UVV0.T0.

TABLE 4. VARIABLE DESCRIPTIONS FOR MODULE UVVO.TO

A$	a single-character user-response variable
A2	an accumulator used by CALL 257
A6	the averaged A/D count from CALL 6
C0	the number of signal values taken from the end of one scan array and placed at the beginning of the next
C2	the CALL 257 indicator number for scan-clear (i.e. stop)
C5	the transmittance signal channel number
C6	the wavelength signal channel number
C7	the CALL 7 channel-indicator number
D7	The CALL 7 initial time delay (in sixtieth seconds)
D8	the CALL 7 between-signal pairs time delay (in sixtieth seconds)
F0$	a file name variable
F1$, F2$, F3$	program location variables; see Table 1
F5	a flag used during program initialization; also used to indicate existence of transmittance calibration data, where: F5 = 0 for data existent F5 = 1 for data not existent
F6	a flag used by the Data Acquisition/Reduction (DAR) subroutine; set to zero before the subroutine and returned as: F6 = 1 for escape during subroutine (before scan) F6 = 2 for completed subroutine function F6 = 3 for escape during scan; restart scan F6 = 4 for escape during scan; restart calibration
I	a loop-counter and general-purpose variable
I0	the number of signal pairs (less one) acquired in a DAR scan
J1, J2	scan array pointers used in the DAR subroutine
K	the column number of the Z data storage array
L	the most recent wavelength evaluated (in the DAR subroutine)
N0	the total number of values to fill the V scan array
N6	the number of A/D counts to be acquired and averaged in a CALL 6
N7	the actual number of values to be put in the V scan array
P	a branching variable
P0	the highest wavelength of the spectrophotometer or V scan array prior to scanning
P1	the limit above which P0 must be before a scan may begin
Q	the midpoint between the upper and lower wavelength bounds, rounded to the nearest ten nanometers
Q1, Q2, Q3	the constants of the wavelength calibration equation
R	the scan speed (in nanometers per minute)

TABLE 4. (Continued)

T	the measured percent transmittance and a general-purpose variable
T0, T9, U0, U9	interpolation variables used in the transmittance calibration check segment T0 the below-set-wavelength 0% transmittance A/D count T9 the below-set-wavelength 100% transmittance A/D count U0 the above-set-wavelenth 0% transmittance A/D count U0 the above-set-wavelenth 100% transmittance A/D count
V()	the CALL 7 scan (data storage)array
W, X, Y	general-purpose variables usually representing wavelength
W0, W1	the lower and upper scan range wavelength bounds, respectively, of the particular automated analysis in operation
X0, X1	the lower and upper wavelength bounds evaluated after a scan portion
Z()	the array in which evaluated A/D counts at nanometer increments are stored, both for zero and 100% transmittance

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE  1
                        PROGRAM LISTING FOR UVV0.TO

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0010 REM          ++++++++++++++++++++++++++++++++++++++++
0020 REM          +    AUTOMATED  ULTRAVIOLET-VISIBLE    +
0030 REM          +       SPECTROPHOTOMETER SYSTEM       +
0040 REM          +     AUT'D ANALYSIS TRANSMITTANCE     +
0050 REM          +     CALIBRATION MODULE:  UVV0.TO     +
0060 REM          +    WRITTEN BY GREG ROTH (4/11/80)    +
0070 REM          +    UNIV. OF CINCI. COMPUTER CENTER   +
0080 REM          ++++++++++++++++++++++++++++++++++++++++
0090 REM
0100 REM
0110 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0120 REM                        PROGRAM INITIALIZATION
0130 REM
0140 REM ----------  SET PAGE/ESC/ROUTE-FLAG
0150 PAGE =72
0160 ON ESC THEN GOTO 0310
0170 LET F5=0
0180 ESC
0190 REM ----------  DIM/INIT STRING VARS.
0200 DIM A$[1],F0$[13],F1$[13],F2$[13],F3$[13]
0210 REM ----------  RETRIEVE SYSTEM STATUS PARMS.
0220 LET F0$="UVV00.TR"
0230 OPEN FILE[0,0],F0$,21
0240 READ FILE[0,1],F1$
0250 READ FILE[0,2],F2$
0260 READ FILE[0,3],F3$
0270 READ FILE[0,6],C5,C6,C7
0280 CLOSE FILE[0]
0290 GOTO 0360
0300 REM ----------  ESCAPE DURING PROGRAM INITIALIZATION
0310 NOESC
0320 CLOSE FILE[0]
0330 LET F5=1
0340 GOTO 0200
0350 REM ----------  MODIFY PROGRAM LOCATION VARS.
0360 LET F1$=F2$
0370 LET F2$=F3$
0380 LET F3$=F1$
0390 IF F5=1 THEN GOTO 3550
0400 ON ESC THEN GOTO 3550
0410 REM ----------  RETRIEVE WAVELENGTH CALIBRATION PARMS.
0420 LET F0$="UVV00.CF"

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE  2
                        PROGRAM LISTING FOR UVV0.TO

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0430 OPEN FILE[1,0],F0$,20
0440 READ FILE[1,1],Q1,Q2,Q3
0450 CLOSE FILE[1]
0460 REM ----------  RETRIEVE TRANSMITTANCE CALIBRATION PARMS.
0470 LET F5=0
0480 LET F0$="UVV0",F1$[6,6],".CF"
0490 OPEN FILE[2,0],F0$,8
0500 READ FILE[2,1],W1,R
0510 READ FILE[2,2],W1,W0
0520 REM   [DIM/INIT SCAN SUBRT. & DATA STORAGE VARS.]
0530 LET I0=79
0540 DIM V[(I0+1)*2],Z[(W1-W0+1),2]
0550 REM   [ACCESS CALIBRATION DATA]
0560 ON ERR THEN GOTO 0630
0570 FOR I=1 TO (W1-W0+1)
0580   READ FILE[2,I+2],Z[I,1],Z[I,2]
0590 NEXT I
0600 CLOSE FILE[2]
0610 ON ERR THEN STOP
0620 GOTO 0680
0630 ON ERR THEN STOP
0640 CLOSE FILE[2]
0650 LET F5=1
0660 GOTO 0680
0670 REM ----------  DIM/INIT CALL 6 & 7 PARMS.
0680 LET N6=5
0690 LET A6=0
0700 LET D7=30
0710 LET D8=3600/R
0720 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0730 REM                          INITIAL SET-UP
0740 REM
0750 ON ESC THEN GOTO 3550
0760 LET Q=INT((W1+W0)/20)*10
0770 PRINT
0780 PRINT "INITIAL SET-UP:"
0790 PRINT  TAB(10);"1.  SET WAVELENGTH AT";Q;"NM."
0800 PRINT  TAB(10);"2.  BLOCK SAMPLE BEAM AND ADJUST FOR 0% TRANSMITT
*      ANCE."
0810 PRINT  TAB(10);"3.  REMOVE BLOCK AND ADJUST FOR 100% TRANSMITTANC
*      E."
0820 PRINT  TAB(10);"4.  ";

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
12345678911234567892123456789312345678941234567895123456789612345678970
         0          0          0          0          0          0      0

0830 ON ERR THEN GOTO 0870
0840 INPUT "PRESS CR KEY TO CONTINUE. ",A$
0850 ON ERR THEN STOP
0860 IF LEN(A$)=0 THEN GOTO 0930
0870 ON ERR THEN STOP
0880 PRINT "<7>"
0890 GOTO 0830
0900 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0910 REM           TRANSMITTANCE CALIBRATION OPTION-SELECT
0920 REM
0930 ON ESC THEN GOTO 3550
0940 ESC
0950 ON ERR THEN GOTO 1040
0960 PRINT
0970 PRINT
0980 PRINT "TRANSMITTANCE:  ";
0990 INPUT "CHECK[1], CALIBRATE[2], CONTINUE[3(CR)]  >>> ",A$
1000 ON ERR THEN STOP
1010 IF LEN(A$)=0 THEN LET A$="3"
1020 LET P=POS("123",A$,1)
1030 ON P THEN GOTO 1110, 1530, 3550
1040 ON ERR THEN STOP
1050 PRINT "<7>"
1060 PRINT "PLEASE ENTER 1, 2, OR 3(CR)."
1070 GOTO 0950
1080 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
1090 REM          TRANSMITTANCE CALIBRATION CHECK SEGMENT
1100 REM
1110 ON ESC THEN GOTO 0930
1120 IF F5=0 THEN GOTO 1160
1130 PRINT "<7>"
1140 PRINT "NO TRANSMITTANCE CALIBRATION DATA FILE."
1150 GOTO 0930
1160 PRINT
1170 PRINT "FOR EACH TRANSMITTANCE CHECKED,"
1180 PRINT "SET WAVELENGTH AND PRESS CR KEY."
1190 PRINT "PRESS ESC KEY TO DISCONTINUE CHECKING."
1200 ON ERR THEN GOTO 1250
1210 PRINT
1220 INPUT "SET WL, PRESS CR KEY  >>> ",A$
1230 ON ERR THEN STOP
1240 IF LEN(A$)=0 THEN GOTO 1280

12345678911234567892123456789312345678941234567895123456789612345678970
         0          0          0          0          0          0      0
```

```
12345678911234567892123456789312345678941234567895123456789612345678970
         0          0          0          0          0          0      0

1250 ON ERR THEN STOP
1260 PRINT "<7>"
1270 GOTO 1200
1280 CALL 6,C6,N6,A6
1290 LET W=Q1+A6*(Q2+Q3*A6)
1300 IF W>=W0 THEN IF W<=W1 THEN GOTO 1360
1310 LET W=INT(W*10+.5)/10
1320 PRINT "<7>"
1330 PRINT "SET WAVELENGTH (";STR$(W);") ";
1340 PRINT "OUT OF BOUNDS (";STR$(W0);" - ";STR$(W1);")."
1350 GOTO 1200
1360 ON ERR THEN STOP
1370 CALL 6,C5,N6,A6
1380 ON ERR THEN STOP
1390 LET Y=INT(W)
1400 IF Y=W1 THEN LET Y=(W1-1)
1410 LET T0=Z[(W1-Y+1),1]
1420 LET T9=Z[(W1-Y+1),2]
1430 LET U0=Z[(W1-Y),1]
1440 LET U9=Z[(W1-Y),2]
1450 LET T0=T0+(W-Y)*(U0-T0)
1460 LET T9=T9+(W-Y)*(U9-T9)
1470 LET T=(A6-T0)/(T9-T0)*100
1480 PRINT USING "   MEAS'D % TRANS AT ###.# NM  >>> ---#.###",W,T
1490 GOTO 1200
1500 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
1510 REM               TRANSMITTANCE CALIBRATION SEGMENT
1520 REM
1530 ON ESC THEN GOTO 0930
1540 REM ---------  SET/SCAN FOR 100% TRANSMITTANCE
1550 PRINT
1560 PRINT "FOR 100% TRANSMITTANCE SCAN:"
1570 PRINT  TAB(10);"1.  MAKE SURE BEAM BLOCK REMOVED."
1580 PRINT  TAB(10);"2.  SET WAVELENGTH AT";(W1+5);"NM."
1590 PRINT  TAB(10);"3.  ";
1600 ON ERR THEN GOTO 1640
1610 INPUT "SET SPECTRO. FOR SCAN AND PRESS CR KEY. ",A$
1620 ON ERR THEN STOP
1630 IF LEN(A$)=0 THEN GOTO 1670
1640 ON ERR THEN STOP
1650 PRINT "<7>"
1660 GOTO 1600

12345678911234567892123456789312345678941234567895123456789612345678970
         0          0          0          0          0          0      0
```

```
A-U-T-'-D  U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                       PAGE  5
                     PROGRAM LISTING FOR UVVO.TO

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
1670 LET K=2
1680 LET F6=0
1690 GOSUB 2390
1700 ON ESC THEN GOTO 0930
1710 ESC
1720 ON F6 THEN GOTO 1770, 0930, 1530, 1530
1730 PRINT "<7>"
1740 PRINT "ABNORMAL SCAN INTERRUPT."
1750 GOTO 0930
1760 REM ----------  SET/SCAN FOR 0% TRANSMITTANCE
1770 PRINT
1780 PRINT "FOR 0% TRANSMITTANCE SCAN:"
1790 PRINT  TAB(10);"1.  INSERT BEAM BLOCK."
1800 PRINT  TAB(10);"2.  SET WAVELENGTH AT";(W1+5);"NM."
1810 PRINT  TAB(10);"3.  ";
1820 ON ERR THEN GOTO 1860
1830 INPUT "SET SPECTRO. FOR SCAN AND PRESS CR KEY. ",A$
1840 ON ERR THEN STOP
1850 IF LEN(A$)=0 THEN GOTO 1890
1860 ON ERR THEN STOP
1870 PRINT "<7>"
1880 GOTO 1820
1890 LET K=1
1900 LET F6=0
1910 GOSUB 2390
1920 ON ESC THEN GOTO 0930
1930 ESC
1940 ON F6 THEN GOTO 1990, 0930, 1770, 1530
1950 PRINT "<7>"
1960 PRINT "ABNORMAL SCAN INTERRUPT."
1970 GOTO 0930
1980 REM   [SMOOTH 0% TRANS. DATA]
1990 LET X=Z[1,1]
2000 LET W=Z[2,1]
2010 FOR I=3 TO (W1-W0-1)
2020   LET Y=X
2030   LET X=W
2040   LET W=-3*(Z[I-2,1]+Z[I+2,1])
2050   LET W=W+12*(Z[I-1,1]+Z[I+1,1])
2060   LET W=W+17*Z[I,1]
2070   LET W=W/35
2080   LET Z[I-2,1]=Y

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                       PAGE  6
                     PROGRAM LISTING FOR UVVO.TO

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2090 NEXT I
2100 LET Z[W1-W0-2,1]=X
2110 LET Z[W1-W0-1,1]=W
2120 PRINT
2130 PRINT "TRANSMITTANCE CALIBRATION COMPLETED."
2140 REM ----------  STORE TRANSMITTANCE CALIB. DATA (OPT.)
2150 ON ERR THEN GOTO 2220
2160 PRINT
2170 INPUT "REJECT NEW CALIBRATION DATA?  [N(CR) OR Y]  >>> ",A$
2180 ON ERR THEN STOP
2190 IF LEN(A$)=0 THEN GOTO 2250
2200 IF A$="N" THEN GOTO 2250
2210 IF A$="Y" THEN GOTO 0930
2220 ON ERR THEN STOP
2230 PRINT "<7>"
2240 GOTO 2150
2250 OPEN FILE[1,0],F0$,8
2260 ON ESC THEN GOTO 2350
2270 WRITE FILE[1,0],SYS(2),SYS(1)
2280 WRITE FILE[1,1],SYS(3),R
2290 FOR I=1 TO (W1-W0+1)
2300   WRITE FILE[1,I+2],Z[I,1],Z[I,2]
2310 NEXT I
2320 CLOSE FILE[1]
2330 LET F5=0
2340 GOTO 0930
2350 NOESC
2360 CLOSE
2370 GOTO 0930
2380 REM ----------  DATA ACQUISITION/REDUCTION SUBROUTINE
2390 ON ESC THEN GOTO 3220
2400 LET F6=1
2410 LET X1=W1
2420 LET P1=X1
2430 LET C0=0
2440 REM   [MAKE SURE WAVELENGTH HIGH ENOUGH]
2450 ON ESC THEN GOTO 3220
2460 CALL 6,C6,N6,A6
2470 LET P0=Q1+Q2*A6+Q3*A6*A6
2480 IF P0>P1 THEN GOTO 2590
2490 PRINT
2500 PRINT "SET WAVELENGTH UP";(P1-INT(P0)+1);"NM."

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                           PAGE  7
                    PROGRAM LISTING FOR UVV0.TO

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2510 ON ERR THEN GOTO 2550
2520 INPUT "PRESS CR KEY TO CONTINUE SCAN. ",A$
2530 ON ERR THEN STOP
2540 IF LEN(A$)=0 THEN GOTO 2450
2550 ON ERR THEN STOP
2560 PRINT "<7>"
2570 GOTO 2510
2580 REM   [MAKE SURE SCAN-TO WL. NOT BELOW (LOW WL.BOUND - 5)]
2590 LET P0=INT(P0)
2600 LET X0=P0-I0
2610 IF X0<(W0-5) THEN LET X0=(W0-5)
2620 PRINT "     SCANNING FROM";P0;"TO";X0;"NM.    ";
2630 REM   [SET #-OF-POINTSPARM. & SCAN]
2640 LET N0=(P0-X0+1)*2
2650 LET N7=N0-C0
2660 ON ESC THEN GOTO 3140
2670 ON ERR THEN GOTO 3470
2680 CALL 7,C7,D7,D8,N7,V[1+C0]
2690 ON ESC THEN GOTO 3220
2700 ON ERR THEN STOP
2710 REM   [CHECK RANGE: HIGH ENOUGH START; OVER HALF SCANNED]
2720 LET W=Q1+V[2]*(Q2+Q3*V[2])
2730 LET Y=Q1+V[N0]*(Q2+Q3*V[N0])
2740 IF W<X1 THEN GOTO 2760
2750 IF (W-Y)>(N0/4) THEN GOTO 2870
2760 PRINT "<7>"
2770 PRINT "PROBLEM IN SCAN RANGE;"
2780 PRINT "SET WAVELENGTH AT";X1+1;"NM.;"
2790 ON ERR THEN GOTO 2830
2800 INPUT "PRESS CR KEY TO CONTINUE SCAN. ",A$
2810 ON ERR THEN STOP
2820 IF LEN(A$)=0 THEN GOTO 2450
2830 ON ERR THEN STOP
2840 PRINT "<7>"
2850 GOTO 2790
2860 REM   [DETERMINE LOWEST WAVELEN IN CALL 7 ARRAY]
2870 LET X0=-INT(-Y)
2880 IF X0<W0 THEN LET X0=W0
2890 REM   [EVALUATE PERCENT TRANSMITTANCE VALUES]
2900 PRINT "EVALUATING AT";X1;"THRU";X0;"NM."
2910 LET J2=0
2920 ON ERR THEN STOP

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                           PAGE  8
                    PROGRAM LISTING FOR UVV0.TO

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2930 FOR I=X1 TO X0 STEP -1
2940   LET J2=J2+2
2950   IF J2>N0 THEN GOTO 3050
2960   LET W=Q1+V[J2]*(Q2+Q3*V[J2])
2970   IF W>=I THEN GOTO 2940
2980   LET J1=J2-2
2990   LET L=I
3000   LET Y=Q1+V[J1]*(Q2+Q3*V[J1])
3010   LET T=(I-Y)/(W-Y)
3020   LET Z[(W1-L+1),K]=V[J1-1]-T*(V[J2-1]-V[J1-1])
3030   LET J2=J1-2
3040 NEXT I
3050 LET X1=L-1
3060 IF X1<W0 THEN RETURN
3070 LET C0=((N0-J1)+2)
3080 FOR I=1 TO C0
3090   LET V[I]=V[(J1-2)+I]
3100 NEXT I
3110 LET P1=X1-1
3120 GOTO 2450
3130 REM   [ESCAPE DURING SCAN; ISSUE SCAN-CLEAR; ROUTE]
3140 LET N0=N7+C0
3150 LET C2=24823
3160 LET A2=0
3170 ON ERR THEN GOTO 3410
3180 CALL 257,C2,A2
3190 ON ERR THEN STOP
3200 PRINT "<7>";
3210 PRINT "SCAN INTERRUPT."
3220 NOESC
3230 ON ESC THEN RETURN
3240 LET F6=2
3250 ESC
3260 ON ERR THEN GOTO 3340
3270 PRINT
3280 PRINT "RESTART SCAN[1], RESTART CALIBRATION[2(CR)]";
3290 INPUT "  >>> ",A$
3300 ON ERR THEN STOP
3310 IF LEN(A$)=0 THEN LET A$="2"
3320 IF A$="1" THEN GOTO 3380
3330 IF A$="2" THEN GOTO 3380
3340 ON ERR THEN STOP

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE  9
                        PROGRAM LISTING FOR UVV0.TO

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
3350 PRINT "<7>"
3360 PRINT "PLEASE ENTER 1 OR 2(CR)."
3370 GOTO 3260
3380 NOESC
3390 LET F6=VAL(A$)+2
3400 RETURN
3410 NOESC
3420 ON ERR THEN STOP
3430 PRINT "<7>"
3440 PRINT "UNEXPECTED ERROR IN CALL 257 SCAN-CLEAR."
3450 LET F6=2
3460 RETURN
3470 NOESC
3480 ON ERR THEN STOP
3490 PRINT "<7>"
3500 PRINT "UNEXPECTED ERROR IN CALL 7."
3510 LET F6=2
3520 RETURN
3530 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
3540 REM          TRANSMITTANCE CALIBRATION EXIT SEGMENT
3550 NOESC
3560 CLOSE
3570 PRINT
3580 LET F0$="UVV00.TR"
3590 OPEN FILE[0,0],F0$,21
3600 WRITE FILE[0,1],F1$
3610 WRITE FILE[0,2],F2$
3620 WRITE FILE[0,3],F3$
3630 CLOSE FILE[0]
3640 CHAIN F3$
3650 FOR I=1 TO (W1-W0+1)
3660   PRINT Z[1,I],Z[2,I]
3670 NEXT I


















1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                         PAGE 10
                          SYMBOL TABLE FOR UVV0.TO

SYMBOL    REFERENCES
------  --------------------------------------------------------------
 0200   0340
 0310   0160
 0360   0290
 0630   0560
 0680   0620  0660
 0830   0890
 0870   0830
 0930   0860  1110  1150  1530  1700  1720  1750  1920  1940  1970
        2210  2340  2370
 0950   1070
 1040   0950
 1110   1030
 1160   1120
 1200   1270  1350  1490
 1250   1200
 1280   1240
 1360   1300
 1530   1030  1720  1940
 1600   1660
 1640   1600
 1670   1630
 1770   1720  1940
 1820   1880
 1860   1820
 1890   1850
 1990   1940
 2150   2240
 2220   2150
 2250   2190  2200
 2350   2260
 2390   1690  1910
 2450   2540  2820  3120
 2510   2570
 2550   2510
 2590   2480
 2760   2740
 2790   2850
 2830   2790
 2870   2750
 2940   2970
 3050   2950
 3140   2660
 3220   2390  2450  2690
 3260   3370
 3340   3260
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                       PAGE 11
                        SYMBOL TABLE FOR UVV0.TO

SYMBOL   REFERENCES
------   -----------------------------------------------------------------
 3380    3320  3330
 3410    3170
 3470    2670
 3550    0390  0400  0750  0930  1030
 A$      0200  0840  0860  0990  1010  1020  1220  1240  1610  1630
         1830  1850  2170  2190  2200  2210  2520  2540  2800  2820
         3290  3310  3320  3330  3390
 A2      3160  3180
 A6      0690  1280  1290  1370  1470  2460  2470
 C0      2430  2650  2680  3070  3080  3140
 C2      3150  3180
 C5      0270  1370
 C6      0270  1280  2460
 C7      0270  2680
 D7      0700  2680
 D8      0710  2680
 F0$     0200  0220  0230  0420  0430  0480  0490  2250  3580  3590
 F1$     0200  0240  0360  0380  0480  3600
 F2$     0200  0250  0360  0370  3610
 F3$     0200  0260  0370  0380  3620  3640
 F5      0170  0330  0390  0470  0650  1120  2330
 F6      1680  1720  1900  1940  2400  3240  3390  3450  3510
 FL#0    0230  0240  0250  0260  0270  0280  0320  3590  3600  3610
         3620  3630
 FL#1    0430  0440  0450  2250  2270  2280  2300  2320
 FL#2    0490  0500  0510  0580  0600  0640
 I       0570  0580  0590  2010  2040  2050  2060  2080  2090  2290
         2300  2310  2930  2970  2990  3010  3040  3080  3090  3100
         3650  3660  3670
 I0      0530  0540  2600
 J1      2980  3000  3020  3030  3070  3090
 J2      2910  2940  2950  2960  2980  3020  3030
 K       1670  1890  3020
 L       2990  3020  3050
 N0      2640  2650  2730  2750  2950  3070  3140
 N6      0680  1280  1370  2460
 N7      2650  2680  3140
 P       1020  1030
 P0      2470  2480  2500  2590  2600  2620  2640
 P1      2420  2480  2500  3110
 Q       0760  0790
 Q1      0440  1290  2470  2720  2730  2960  3000
 Q2      0440  1290  2470  2720  2730  2960  3000
 Q3      0440  1290  2470  2720  2730  2960  3000
 R       0500  0710  2280
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                       PAGE 12
                        SYMBOL TABLE FOR UVV0.TO

SYMBOL   REFERENCES
------   -----------------------------------------------------------------
 T       1470  1480  3010  3020
 T0      1410  1450  1470
 T9      1420  1460  1470
 U0      1430  1450
 U9      1440  1460
 V[      0540  2680  2720  2730  2960  3000  3020  3090
 W       1290  1300  1310  1330  1390  1450  1460  1480  2000  2030
         2040  2050  2060  2070  2110  2720  2740  2750  2960  2970
         3010
 W0      0510  0540  0570  0760  1300  1340  2010  2100  2110  2290
         2610  2880  3060  3650
 W1      0500  0510  0540  0570  0760  1300  1340  1400  1410  1420
         1430  1440  1580  1800  2010  2100  2110  2290  2410  3020
         3650
 X       1990  2020  2030  2100
 X0      2600  2610  2620  2640  2870  2880  2900  2930
 X1      2410  2420  2740  2780  2900  2930  3050  3060  3110
 Y       1390  1400  1410  1420  1430  1440  1450  1460  2020  2080
         2730  2750  2870  3000  3010
 Z[      0540  0580  1410  1420  1430  1440  1990  2000  2040  2050
         2060  2080  2100  2110  2300  3020  3660
```

TRANSMITTANCE CALIBRATION FILE STRUCTURE

The first three records, that is, zero through two of each transmittance calibration file are initialized in the corresponding main analysis modules.

TABLE 5. STRUCTURE OF A TRANSMITTANCE CALIBRATION FILE

File name: UVVOC.CF (for chlorophyll)
UVVOL.CF (for color)
UVVOQ.CF (for quality assurance)

File type: fixed-length binary random access

Record length: 8 bytes

File number: 2

Record	File content
0	D1, D2
1	D3, R
2	W1, W0
3	T^{0}_{W1}, T^{100}_{W1}
4	$T^{0}_{(W1-1)}$, $T^{100}_{(W1-1)}$
	. .
	. .
	. .
(W1-W0+3)	T^{0}_{W0}, T^{100}_{W0}

Where:

D1-D3 are the month, day, and year of last calibration

R is the scan speed in nanometers per minute

W1, W0 are the upper and lower scan range wavelength bounds

T^{K}_{I} is the K% transmittance signal at I nanometers, and where:
K = 0 or 100,
I is an integer and $W0 \leq I \leq W1$

SECTION 4

PLOTTING

The plot module is executed as either a dependent of the UVVIS system, or an independent function through a plotting directory identifier. In the former case, the "destination" program upon entry to the module is UVVO.PO, while in the latter, it may be any other program.

PLOT MODULE -- UVVO.PO

UVVO.PO is chained to from UVVO.OO or INITIALIZE.2. (The modification of program location variables follows only when the module has been chained to from UVVO.OO.) The plot run-parameters file is examined. A file input/output error other than 'no file' aggravates a forced program exit. Otherwise, unless all six parameters are established, they are automatically defined.

Plot run-parameters are submitted to the user for change or approval. To begin, the terminal is specified as plotting or non-plotting. For a plotting terminal, the terminal make (i.e. Tektronix or Hewlett-Packard) must be indicated, as well as the use of the grid feature. For a non-plotting terminal, listing nanometer increments may be made the same for each plot, in which case an increment of 1, 2, 5, or 10 nanometers is selected. The changed or approved parameters are written to the run-parameters file.

A subroutine is used to receive and examine all alphanumeric run-parameter inputs. Another subroutine validates the chosen nanometer increment.

At the plot primary command level, a plot or exit command is received. To begin processing a plot command, the correct plot data and plot reference file names are derived. The plot reference file is examined. Should no plots be available, program flow is sent back to the command line.

When exiting, the variable F3$ is the "present" program, due to the unconventional variables modification in the program initialization section. A "present" program of UVVO.PO indicates that the plot function is being exercised as a command of the UVVIS system, and thus the plot module chains to the master command module. Otherwise, a BYE is issued.

UVVO.PO has been designed to prod the flow of control to the program exit point. This feature deprives the program of exclusive use of the plotting terminal. The function is accomplished by placing time-out limits on the plot primary command line, the plot secondary option line, and the post-plot delay time.

Processing a Plot Command

For plot commands, three options are available: 1) list plot information; 2) plot or prepare list plot curves; or 3) exit (to the primary command line). For either of the first two items of this plot secondary option level, if more than one plot is available, then the system requests the user to select either a single plot or a portion of plots. When a portion is chosen, the input must be of the form "N1-N2," where the following criteria are satisfied:

- N1 and N2 are positive integers;
- N1 > 0;
- N1 ≤ N2;
- N2 ≤ the total number of available plots;
- no spaces separate the number and the dash.

For listing plot information, selected portions of each plot reference file block are retrieved and displayed.

For plots, a loop is established. The plot reference file block data for each plot is first formatted. The program then branches to the correct segment, within the loop, for processing graphs or listed plot curves.

In the case of graph plots, the grid option run-parameter is first examined. If it is a "P" then a prompt asks the user if a grid is to accompany the plot. Having received the response, the plot reference information is placed on the screen, axes and labels etched, the grid overlayed (if selected), and data fetched from the plot data file and drawn. If two sets of plot data are required, the second line is dashed by omitting every third point. The plot is followed by a sixty-second response time.

In the case of listed plot curves, the nanometer increment run-parameter is examined. If it is a "P" then the increment is received. Plot reference information and plot data are formatted into a list file. When two sets of plot data are needed, the second set replaces the star symbol with an exclamation point, and in this way mimics the "dashed line" effect. Three options enable a terminal listing, a lineprinter listing, or a continuance of the procedure.

Plots are processed sequentially. Escapes issued during the preparation of a plot interrupt only that plot, and direct control to the next one in the sequence. Once the last plot has been dealt with, program control retreats to the secondary option level.

Primary plot operations are accomplished by subroutines. These subroutines are adequately described in another document, written for the Advanced Instrumentation Section.[2]

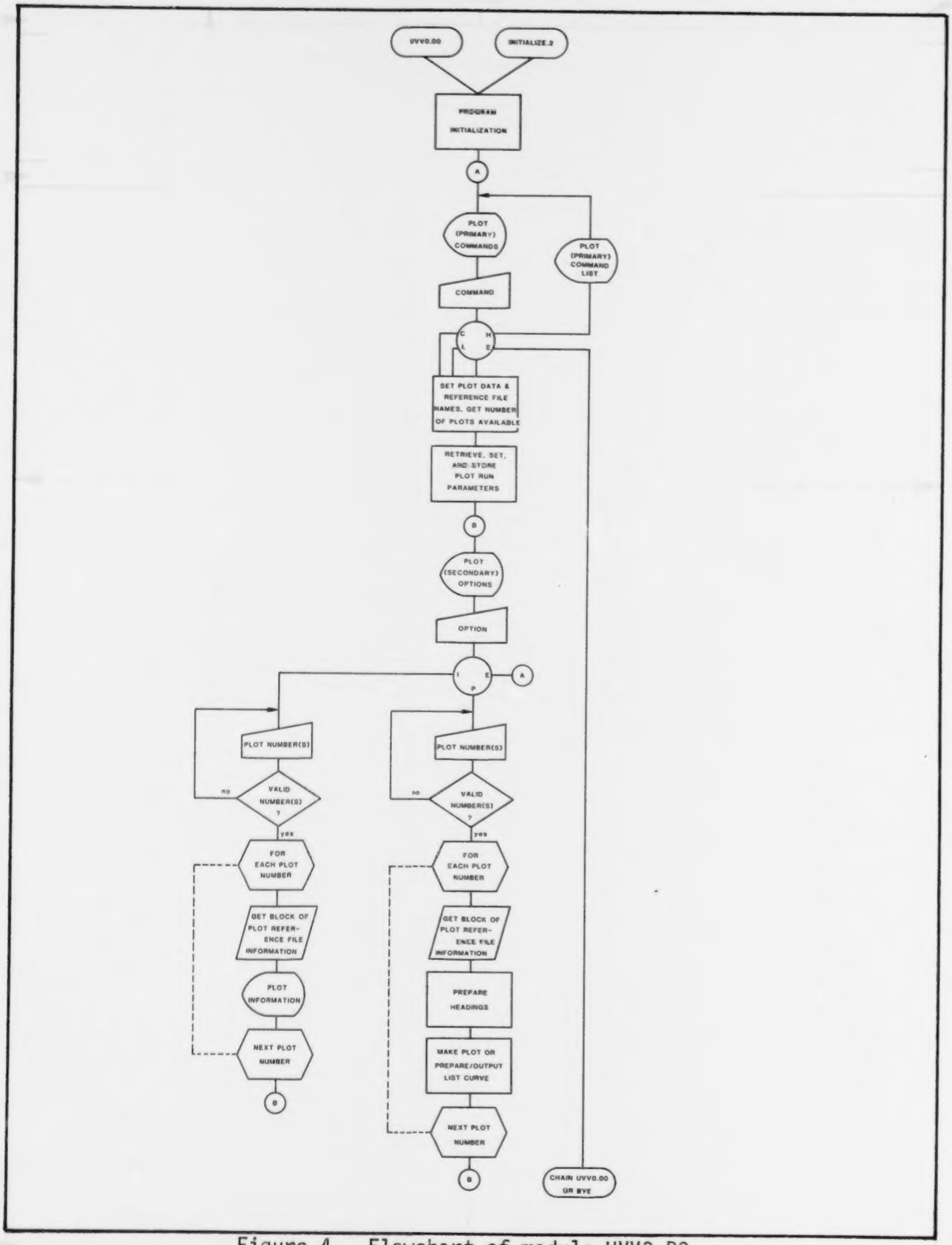
UVV0.00
INITIALIZE.2
PROGRAM INITIALIZATION
A
PLOT (PRIMARY) COMMANDS
PLOT (PRIMARY) COMMAND LIST
COMMAND
C
H
L
E
SET PLOT DATA & REFERENCE FILE NAMES, GET NUMBER OF PLOTS AVAILABLE
RETRIEVE, SET, AND STORE PLOT RUN PARAMETERS
B
PLOT (SECONDARY) OPTIONS
OPTION
I
E
P
A
PLOT NUMBER(S)
VALID NUMBER(S) ?
no
yes
FOR EACH PLOT NUMBER
GET BLOCK OF PLOT REFERENCE FILE INFORMATION
PLOT INFORMATION
NEXT PLOT NUMBER
B
PLOT NUMBER(S)
VALID NUMBER(S) ?
no
yes
FOR EACH PLOT NUMBER
GET BLOCK OF PLOT REFERENCE FILE INFORMATION
PREPARE HEADINGS
MAKE PLOT OR PREPARE/OUTPUT LIST CURVE
NEXT PLOT NUMBER
B
CHAIN UVV0.00 OR BYE

Figure 4. Flowchart of module UVV0.P0.

TABLE 6. VARIABLE DESCRIPTIONS FOR MODULE UVVO.PO

A$	a single-character user-response and general-purpose variable
AO$	the plot primary command
B$	a character string composed of blanks
BO	the number of blocks in the plot reference file
C$	the plot primary command line
C1$	the plot secondary option line
C2$	the listed plot curve output options
D	the number or x-axis graph divisions
DO	the wavelength increment of each x-axis graph division
FO$	a file name variable
F1$, F2$, F3$	program location variables; see Table 1
F4	a flag used during program initialization
F4$	the plot data file name
F5	a flag used by the response-processing, value-check, and plotting subroutines, where:

- in response-processing subroutine:

Before subroutine	After subroutine
F5 = 2 for character input	F5 = 2 for escape during subroutine F5 = 0 for new value entered F5 = 1 for input error F5 = 3 for value accepted
F5 = 3 for numeric input	F5 = 3 for escape during subroutine F5 = 0 for new value entered F5 = 1 for error in value F5 = 2 for value accepted

- in value-check subroutine:

Before subroutine	After subroutine
F5 = 0	F5 = 0 for escape during subroutine F5 = 1 for acceptable value F5 = 2 for erroneous value

- in plotting subroutines:

Before subroutine	After subroutine
F5 = 0	F5 = 0 for completed subrt. function F5 > 0 for escape during subroutine
or	
F5 = 1	F5 = 1 for completed subrt. function F5 > 1 for escape during subroutine

TABLE 6. (continued)

F5$	the plot reference file name
G$	the grid option for a plot
G1	the left margin of the plot graph axes and field
G2	the bottom margin of the plot graph axes and field
H0$	the minor-heading and general-purpose character string
H1$, H2$	major-heading and general-purpose character strings
I	a loop-counter and general-purpose variable
I1$	the character string containing all possible run-parameters
I2$	a substring of I1$, used in the response-processing subroutine
I3$	the character string containing user-chosen run-parameters
J, K, K1, K2, L	loop-counter and general-purpose variables
L$	a general-purpose character string
L0	the left margin of the entire plot graph
L1, L2	the starting and ending plot numbers for information-listing or plotting loops
L1$, L2$, L3$, L4$	the second through fifth lines, respectively, of the plot heading
M1, M2, M3	the analysis date (month, day, and year)
N1, N2	the plot data file record pointers for the first and second (if used) sets of scan data
N3$	the input character string of the response-processing subroutine
N4$	a character string composed of valid numeric characters
O$	an output character string used in the plot secondary option line
P	a character string index and general-purpose variable
P0	the loop-counter variable for plots and listed plot curves
P1, P2	the x and y coordinates, respectively, of a plot point; also general-purpose variables
P3	an indicator used by the plotting subroutines, where: P3 = 2 for drawing a light (seen) vector P3 = 3 for drawing a dark (unseen) vector
P4$	the character string used by the plotting subroutines which controls terminal plotting
Q1, Q3, Q3, Q4, Q5	variables used by the axis-plotting subroutine Q1, Q2 starting x and y coordinates, respectively Q3 the number of divisions (number of ticks less one) Q4 the distance between tick marks Q5 the direction of the tick mark, where: Q5 = 1 or -1 for rightward or leftward Q5 = 2 or -2 for upward or downward
S	the number of sets of scan data per plot
V	the value of an item in the plot data file
V0()	a raw data storage array used in plotting
W$	a control character in each output list file record
W0, W1	the lower and upper scan range wavelength bounds

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                     PAGE  1
                    PROGRAM LISTING FOR UVV0.PO
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0010 REM            ++++++++++++++++++++++++++++++++++++++
0020 REM            +     AUTOMATED  ULTRAVIOLET-VISIBLE     +
0030 REM            +       SPECTROPHOTOMETER SYSTEM         +
0040 REM            +          PLOT MODULE: UVV0.PO          +
0050 REM            +     WRITTEN BY GREG ROTH  (5/5/80)     +
0060 REM            +     UNIV. OF CINCI. COMPUTER CENTER    +
0070 REM            +     (UVV0.PO ACTS AS AN INDEPENDENT    +
0080 REM            +      MODULE OR AS A SUB-MODULE OF      +
0090 REM            +      THE UVVIS MASTER COMMAND MOD.)    +
0100 REM            ++++++++++++++++++++++++++++++++++++++
0110 REM
0120 REM
0130 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0140 REM
0150 REM                    PROGRAM INITIALIZATION
0160 REM ---------- SET PAGE/ESC/ROUTE-FLAG
0170 REM
0180 PAGE =75
0190 ON ESC THEN GOTO 0430
0200 LET F4=0
0210 ESC
0220 REM ----------    DIM/INIT STRING VARS.
0230 DIM F0$[13],F1$[13],F2$[13],F3$[13],F4$[13],F5$[13]
0240 DIM H0$[20],H1$[40],H2$[40],L$[72],W$[1]
0250 DIM L1$[71],L2$[71],L3$[71],L4$[71],V0[151]
0260 DIM B$[48],O$[16],P4$[4],A$[1],G$[1],N3$[8],N4$[12]
0270 DIM I3$[6],I1$[9],I2$[3],C$[4],C1$[3],C2$[3],A0$[1]
0280 LET N4$="0123456789-."
0290 LET C$="CLEH"
0300 LET C1$="IPE"
0310 LET C2$="123"
0320 LET I1$="PNHTNAPSP"
0330 FOR I=1 TO 48 STEP 2
0340   LET B$[I,I+1]="  "
0350 NEXT I
0360 DELAY =.8
0370 LET F5=0
0380 GOSUB 7970
0390 ON ESC THEN GOTO 0430
0400 IF F5>0 THEN GOTO 0430
0410 GOTO 0480
0420 REM ----------  ESCAPE DURING PROGRAM INITIALIZATION
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                     PAGE  2
                    PROGRAM LISTING FOR UVV0.PO
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0430 NOESC
0440 CLOSE
0450 DIM F0$[13],F1$[13],F2$[13],F3$[13]
0460 LET F4=1
0470 REM ----------  RETRIEVE SYSTEM STATUS PARMS.
0480 LET F0$="UVV00.TR"
0490 ON ERR THEN GOTO 0510
0500 RENAME F0$,F0$
0510 ON ERR THEN STOP
0520 IF SYS(7)=-9 THEN GOTO 0580
0530 IF SYS(7)<>-48 THEN GOTO 0560
0540 DELAY =.2
0550 GOTO 0490
0560 PRINT "<7>NO SYSTEM STATUS TRANSFER FILE EXISTS."
0570 BYE
0580 OPEN FILE[0,0],F0$,21
0590 READ FILE[0,1],F1$
0600 READ FILE[0,2],F2$
0610 READ FILE[0,3],F3$
0620 IF F3$<>"UVV0.PO" THEN GOTO 0680
0630 REM   [MODIFY PROGRAM LOCATION VARS.]
0640 NOESC
0650 WRITE FILE[0,1],F2$
0660 WRITE FILE[0,2],F3$
0670 WRITE FILE[0,3],F2$
0680 CLOSE FILE[0]
0690 IF F4=1 THEN GOTO 6850
0700 ESC
0710 REM ----------  RETRIEVE PLOT RUN PARMS.
0720 ON ESC THEN GOTO 6850
0730 LET F0$="UVV0P.RP"
0740 ON ERR THEN GOTO 0810
0750 OPEN FILE[1,3],F0$
0760 LREAD FILE[1],I3$,W$
0770 CLOSE FILE[1]
0780 ON ERR THEN STOP
0790 IF LEN(I3$)<6 THEN LET I3$="PTNS 1"
0800 GOTO 0910
0810 ON ERR THEN STOP
0820 CLOSE
0830 IF SYS(7)=-10 THEN GOTO 0870
0840 PRINT "<7>"
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                      PAGE  3
                     PROGRAM LISTING FOR UVV0.PO

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0850 PRINT "PROBLEM IN PLOT RUN PARMS. FILE; SYS(7) =";SYS(7)
0860 GOTO 6850
0870 LET I3$="PTNS 1"
0880 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0890 REM                  PLOT RUN PARAMETERS SECTION
0900 REM
0910 PRINT
0920 LET F5=2
0930 LET I2$=I1$[1,2]
0940 LET L$="TERMINAL TYPE -- PLOTTING [P] OR NON-PLOTTING [N] : "
0950 PRINT L$;I3$[1,1]
0960 GOSUB 6930
0970 ON ESC THEN GOTO 6850
0980 ON F5 THEN GOTO 0920, 6850, 1010
0990 LET I3$[1,1]=N3$
1000 GOTO 0920
1010 IF I3$[1,1]="N" THEN GOTO 1210
1020 LET F5=2
1030 LET I2$=I1$[3,4]
1040 LET L$="TERMINAL MAKE -- HEWLETT-PACKARD [H] OR "
1050 LET L$=L$,"TEKTRONIX [T] : "
1060 PRINT L$;I3$[2,2]
1070 GOSUB 6930
1080 ON ESC THEN GOTO 6850
1090 ON F5 THEN GOTO 1020, 6850, 1120
1100 LET I3$[2,2]=N3$
1110 GOTO 1020
1120 LET F5=2
1130 LET I2$=I1$[5,7]
1140 LET L$="GRID OVERLAY -- NEVER [N], ALWAYS [A], OR PER PLOT [P] :
*    "
1150 PRINT L$;I3$[3,3]
1160 GOSUB 6930
1170 ON ESC THEN GOTO 6850
1180 ON F5 THEN GOTO 1120, 6850, 1420
1190 LET I3$[3,3]=N3$
1200 GOTO 1120
1210 LET F5=2
1220 LET I2$=I1$[8,9]
1230 LET L$="LISTING NM. INC. -- SAME ALL PLOTS [S] OR PER PLOT [P] :
*    "
1240 PRINT L$;I3$[4,4]

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                      PAGE  4
                     PROGRAM LISTING FOR UVV0.PO

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
1250 GOSUB 6930
1260 ON ESC THEN GOTO 6850
1270 ON F5 THEN GOTO 1210, 6850, 1300
1280 LET I3$[4,4]=N3$
1290 GOTO 1210
1300 IF I3$[4,4]="P" THEN GOTO 1420
1310 LET F5=3
1320 LET L$="SET LISTING NANOMETER INCREMENT : "
1330 PRINT L$;I3$[5,6]
1340 GOSUB 6930
1350 ON ESC THEN GOTO 6850
1360 ON F5 THEN GOTO 1310, 1420, 6850
1370 GOSUB 7340
1380 ON ESC THEN GOTO 6850
1390 IF F5=0 THEN GOTO 6850
1400 GOTO 1310
1410 REM ----------  STORE PLOT RUN PARMS.
1420 OPEN FILE[1,1],F0$
1430 PRINT FILE[1],I3$
1440 CLOSE FILE[1]
1450 GOTO 1570
1460 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
1470 REM                  PLOT PRIMARY COMMAND LEVEL
1480 REM
1490 REM ----------  PLOT COMMAND LIST
1500 ON ESC THEN GOTO 1570
1510 PRINT
1520 PRINT "C  ---  CHLOROPHYLL ANALYSIS PLOT"
1530 PRINT "L  ---  COLOR EVALUATION PLOT"
1540 PRINT "E  ---  END OF PLOT SESSION"
1550 PRINT "H  ---  HELP"
1560 REM ----------  PLOT COMMAND SELECT
1570 ON ESC THEN GOTO 6850
1580 ESC
1590 ON ERR THEN GOTO 1660
1600 TIME =30
1610 PRINT
1620 TINPUT "PLOT COMMANDS:  C, L, E, H(CR)  >>> ",A0$
1630 ON ERR THEN STOP
1640 IF LEN(A0$)=0 THEN LET A0$="H"
1650 ON (POS(C$,A0$,1)+1) THEN GOTO 1680, 1720, 1720, 6850, 1500
1660 ON ERR THEN STOP

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
1670 IF SYS(7)=60 THEN GOTO 6850
1680 PRINT "<7>"
1690 PRINT "INVALID COMMAND."
1700 GOTO 1590
1710 REM ----------  PLOT PREPARATION
1720 ON ESC THEN GOTO 1910
1730 LET F4$="UVV0",A0$,".PF"
1740 LET F5$="UVV0",A0$,".PR"
1750 ON ERR THEN GOTO 1770
1760 RENAME F5$,F5$
1770 ON ERR THEN STOP
1780 IF SYS(7)=-48 THEN DELAY =1
1790 IF SYS(7)=-48 THEN GOTO 1750
1800 OPEN FILE[6,0],F5$,41
1810 READ FILE[6,0],B0
1820 CLOSE FILE[6]
1830 IF B0>0 THEN GOTO 1870
1840 PRINT "<7>"
1850 PRINT "NO PLOTS AVAILABLE."
1860 GOTO 1910
1870 LET O$="PLOT"
1880 IF I3$[1,1]="N" THEN LET O$="LIST PLOT CURVE"
1890 GOTO 1980
1900 REM   [ESC DURING PLOT PREP.]
1910 NOESC
1920 CLOSE
1930 GOTO 1570
1940 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
1950 REM                 PLOT SECONDARY OPTION LEVEL
1960 REM
1970 REM ----------  PLOT OPTION-SELECT
1980 ON ESC THEN GOTO 1570
1990 ESC
2000 ON ERR THEN GOTO 2090
2010 TIME =30
2020 PRINT
2030 PRINT STR$(B0);" AVAILABLE PLOT(S) --"
2040 PRINT "  DISPLAY INFO [I], ";O$;" [P] OR END PLOTTING [E(CR)]";
2050 TINPUT "  >>> ",A$
2060 ON ERR THEN STOP
2070 IF LEN(A$)=0 THEN LET A$="E"
2080 ON (POS(C1$,A$,1)+1) THEN GOTO 2110, 2150, 2150, 1570

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2090 ON ERR THEN STOP
2100 IF SYS(7)=60 THEN GOTO 1570
2110 PRINT "<7>"
2120 PRINT "INVALID OPTION"
2130 GOTO 2000
2140 REM ----------  RETRIEVE PLOT #S FOR INFO.-LIST OR PLOT
2150 ON ESC THEN GOTO 1980
2160 IF B0=1 THEN LET N3$=STR$(B0)
2170 IF B0=1 THEN GOTO 2230
2180 ON ERR THEN GOTO 2350
2190 PRINT
2200 PRINT "PLOT NUMBERS  [1-";STR$(B0);
2210 INPUT "]  : ",N3$
2220 ON ERR THEN STOP
2230 LET L=LEN(N3$)
2240 IF L=0 THEN GOTO 2350
2250 FOR I=1 TO L
2260   IF POS(N4$[1,11],N3$[I,I],1)=0 THEN GOTO 2350
2270 NEXT I
2280 LET P=POS(N3$,N4$[11,11],1)
2290 ON ERR THEN GOTO 2350
2300 LET L2=VAL(N3$[P+1,L])
2310 LET L1=L2
2320 IF P>0 THEN LET L1=VAL(N3$[1,P-1])
2330 ON ERR THEN STOP
2340 IF L1>0 THEN IF L1<=L2 THEN IF L2<=B0 THEN GOTO 2400
2350 ON ERR THEN STOP
2360 PRINT "<7>"
2370 PRINT "INVALID NUMBER(S)."
2380 GOTO 2180
2390 REM ----------  BRANCH TO PLOT INFO. LIST OR GENERATION
2400 IF A$="P" THEN GOTO 2700
2410 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
2420 REM                  LIST PLOT INFORMATION
2430 REM
2440 ON ESC THEN GOTO 2640
2450 ON ERR THEN GOTO 2470
2460 RENAME F5$,F5$
2470 ON ERR THEN STOP
2480 IF SYS(7)=-48 THEN DELAY =1
2490 IF SYS(7)=-48 THEN GOTO 2450
2500 OPEN FILE[6,0],F5$,41

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2510 LET L$="###.   ####################"
2520 FOR I=L1 TO L2
2530   LET J=2+(I-1)*5
2540   READ FILE[6,J],H0$
2550   READ FILE[6,J+1],H1$
2560   READ FILE[6,J+3],H2$
2570   PRINT USING L$,I,H0$
2580   LET L1$=B$[1,7],H1$[1,30]
2590   LET L1$=L1$,B$[1,41-LEN(L1$)]
2600   PRINT L1$;H2$[1,30]
2610 NEXT I
2620 CLOSE FILE[6]
2630 GOTO 1980
2640 NOESC
2650 CLOSE
2660 GOTO 1980
2670 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
2680 REM                      PLOT(S) GENERATION
2690 REM
2700 FOR P0=L1 TO L2
2710   REM ----------  RETRIEVE PLOT REF. FILE INFO. & PREPARE HEADING
2720   ON ESC THEN GOTO 6760
2730   ESC
2740   ON ERR THEN GOTO 2760
2750   RENAME F5$,F5$
2760   ON ERR THEN STOP
2770   IF SYS(7)=-48 THEN DELAY =1
2780   IF SYS(7)=-48 THEN GOTO 2740
2790   OPEN FILE[6,0],F5$,41
2800   READ FILE[6,0],B0,M1,M2,M3
2810   READ FILE[6,1],L$
2820   LET L2$="ANALYST: ",L$[1,20]
2830   LET L3$="INSTRUMENT: ",L$[21]
2840   LET L2$=L2$,B$[1,71-(LEN(L2$)+LEN(L3$))],L3$
2850   LET J=2+(P0-1)*5
2860   READ FILE[6,J],H0$,W0,W1,S,N1,N2
2870   LET L1$="ANALYSIS: "
2880   IF A0$="C" THEN LET L1$=L1$,"CHLOROPHYLL - "
2890   IF A0$="L" THEN LET L1$=L1$,"COLOR EVALUATION - "
2900   LET L1$=L1$,H0$
2910   LET L$="ANALYSIS DATE: ",STR$(M1),"/",STR$(M2),"/"
2920   LET L$=L$,STR$(M3-INT(M3/100)*100)

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2930   LET L1$=L1$,B$[1,71-(LEN(L1$)+LEN(L$))],L$
2940   READ FILE[6,J+1],H1$
2950   READ FILE[6,J+2],H2$
2960   LET L3$=H1$,B$[1,71-(LEN(H1$)+LEN(H2$))],H2$
2970   READ FILE[6,J+3],H1$
2980   READ FILE[6,J+4],H2$
2990   LET L4$=H1$,B$[1,71-(LEN(H1$)+LEN(H2$))],H2$
3000   CLOSE FILE[6]
3010   IF I3$[1,1]="N" THEN GOTO 5410
3020   REM ---------- PLOT GRAPHICALLY
3030   LET G$="N"
3040   IF I3$[3,3]="A" THEN LET G$="Y"
3050   IF I3$[3,3]<>"P" THEN GOTO 3210
3060   DELAY =.8
3070   ON ERR THEN GOTO 3160
3080   TIME =20
3090   PRINT
3100   IF (L2-L1)>0 THEN PRINT "FOR PLOT ";STR$(P0);":  ";
3110   TINPUT "USE GRID OVERLAY ?  [N(CR) OR Y]  >>> ",G$
3120   ON ERR THEN STOP
3130   IF LEN(G$)=0 THEN LET G$="N"
3140   IF G$="N" THEN GOTO 3210
3150   IF G$="Y" THEN GOTO 3210
3160   ON ERR THEN STOP
3170   IF SYS(7)=60 THEN GOTO 3130
3180   PRINT "<7>"
3190   GOTO 3070
3200   REM   [PREPARE DIVISIONS, LEFT MARGIN; CLEAR SCREEN]
3210   LET D=14
3220   IF A0$="L" THEN LET D=12
3230   LET D0=(W1-W0)/D
3240   LET L0=28
3250   IF I3$[2,2]="T" THEN PRINT "<27><12>"
3260   IF I3$[2,2]="T" THEN GOTO 3300
3270   PRINT "<27>H<27>J"
3280   PRINT "<27>&S1P0Q"
3290   REM   [PRINT HEADING]
3300   ON ESC THEN GOTO 5360
3310   DELAY =.8
3320   LET J=L0
3330   LET P1=J
3340   LET K=760

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                         PAGE  9
                    PROGRAM LISTING FOR UVV0.P0

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
3350   LET P2=K
3360   LET P3=3
3370   LET F5=0
3380   GOSUB 8100
3390   ON ESC THEN GOTO 5360
3400   IF F5>0 THEN GOTO 5360
3410   PRINT "<29>";P4$[4,4];"<31>";
3420   PRINT B$[1,18];"UVVIS  SPECTROPHOTOMETRIC  ANALYSIS"
3430   LET P1=J+250
3440   LET P2=K-5
3450   GOSUB 8100
3460   ON ESC THEN GOTO 5360
3470   IF F5>0 THEN GOTO 5360
3480   LET P1=P1+488
3490   LET P3=2
3500   GOSUB 8100
3510   ON ESC THEN GOTO 5360
3520   IF F5>0 THEN GOTO 5360
3530   LET P1=J
3540   LET P3=3
3550   FOR I=0 TO 3
3560     LET P2=(K-31)-I*22
3570     GOSUB 8100
3580     ON ESC THEN GOTO 5360
3590     IF F5>0 THEN GOTO 5360
3600     PRINT "<29>";P4$[4,4];"<31>";
3610     IF I=0 THEN PRINT L1$
3620     IF I=1 THEN PRINT L2$
3630     IF I=2 THEN PRINT L3$
3640     IF I=3 THEN PRINT L4$
3650   NEXT I
3660   REM   [PLOT AXES: SETTING LEFT & BOTTOM PLOT MARGINS]
3670   LET G1=L0+89
3680   LET G2=70
3690   LET Q1=G1
3700   LET Q2=G2+580
3710   LET Q3=10
3720   LET Q4=-58
3730   LET Q5=1
3740   GOSUB 7530
3750   ON ESC THEN GOTO 5360
3760   IF F5>0 THEN GOTO 5360

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                         PAGE 10
                    PROGRAM LISTING FOR UVV0.P0

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
3770   LET Q2=G2
3780   LET Q3=D
3790   LET Q4=900/D
3800   LET Q5=2
3810   GOSUB 7530
3820   ON ESC THEN GOTO 5360
3830   IF F5>0 THEN GOTO 5360
3840   LET Q1=G1+900
3850   LET Q3=10
3860   LET Q4=58
3870   LET Q5=-1
3880   GOSUB 7530
3890   ON ESC THEN GOTO 5360
3900   IF F5>0 THEN GOTO 5360
3910   LET Q2=G2+580
3920   LET Q3=D
3930   LET Q4=-900/D
3940   LET Q5=-2
3950   GOSUB 7530
3960   ON ESC THEN GOTO 5360
3970   IF F5>0 THEN GOTO 5360
3980   REM   [LABEL AXES]
3990   IF A0$="C" THEN LET L$="ABSORBANCE"
4000   IF A0$="L" THEN LET L$="PERCENT TRANSMITTANCE"
4010   LET P1=L0
4020   LET P2=G2+INT((560+21*LEN(L$))/2)
4030   LET P2=19+INT((P2-22)/22+.5)*22
4040   LET P3=3
4050   FOR I=1 TO LEN(L$)
4060     GOSUB 8100
4070     ON ESC THEN GOTO 5360
4080     IF F5>0 THEN GOTO 5360
4090     PRINT "<29>";P4$[4,4];"<31>";L$[I,I]
4100     LET P2=P2-22
4110   NEXT I
4120   LET L$="WAVELENGTH (IN NANOMETERS)"
4130   LET P1=G1+INT((900-14*LEN(L$))/2)
4140   LET P2=0
4150   GOSUB 8100
4160   ON ESC THEN GOTO 5360
4170   IF F5>0 THEN GOTO 5360
4180   PRINT "<29>";P4$[4,4];"<31>";L$

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE 11
                      PROGRAM LISTING FOR UVV0.PO

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
4190   REM   [NUMBER THE AXES]
4200   LET P1=G1+878
4210   LET P2=G2-34
4220   LET P3=3
4230   FOR I=W1 TO W0 STEP -D0
4240     GOSUB 8100
4250     ON ESC THEN GOTO 5360
4260     IF F5>0 THEN GOTO 5360
4270     PRINT "<29>";P4$[4,4];"<31>";STR$(INT(I))
4280     LET P1=P1-(900/D)
4290   NEXT I
4300   LET P1=G1-56
4310   LET P2=G2-8
4320   LET J=1
4330   LET H0$="<29>#<31>#.#"
4340   IF A0$="L" THEN LET J=100
4350   IF A0$="L" THEN LET H0$[5,5]="#"
4360   FOR I=0 TO J STEP (J/10)
4370     GOSUB 8100
4380     ON ESC THEN GOTO 5360
4390     IF F5>0 THEN GOTO 5360
4400     PRINT USING H0$,P4$[4,4],I
4410     LET P2=P2+58
4420   NEXT I
4430   IF G$="N" THEN GOTO 4880
4440   REM   [PLOT GRID LINES]
4450   LET J=900/D*2
4460   LET K=580/5
4470   FOR P1=(G1+J) TO (G1+900-J) STEP J
4480     LET P2=G2
4490     LET P3=3
4500     GOSUB 8100
4510     ON ESC THEN GOTO 5360
4520     IF F5>0 THEN GOTO 5360
4530     FOR I=(G2+K) TO (G2+580) STEP K
4540       LET P2=I-4
4550       IF I=G2+580 THEN LET P2=I
4560       LET P3=2
4570       GOSUB 8100
4580       ON ESC THEN GOTO 5360
4590       IF F5>0 THEN GOTO 5360
4600       LET P2=I+4

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE 12
                      PROGRAM LISTING FOR UVV0.PO

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
4610         LET P3=3
4620         GOSUB 8100
4630         ON ESC THEN GOTO 5360
4640         IF F5>0 THEN GOTO 5360
4650       NEXT I
4660     NEXT P1
4670     FOR P2=(G2+K) TO (G2+580-K) STEP K
4680       LET P1=G1
4690       LET P3=3
4700       GOSUB 8100
4710       ON ESC THEN GOTO 5360
4720       IF F5>0 THEN GOTO 5360
4730       FOR I=(G1+J) TO (G1+900) STEP J
4740         LET P1=I-4
4750         IF I=(G1+900) THEN LET P1=I
4760         LET P3=2
4770         GOSUB 8100
4780         ON ESC THEN GOTO 5360
4790         IF F5>0 THEN GOTO 5360
4800         LET P1=I+4
4810         LET P3=3
4820         GOSUB 8100
4830         ON ESC THEN GOTO 5360
4840         IF F5>0 THEN GOTO 5360
4850       NEXT I
4860     NEXT P2
4870     REM   [PLOT THE DATA]
4880     LET L=1
4890     IF A0$="L" THEN LET L=100
4900     LET P=W1-W0
4910     FOR I=1 TO S
4920       LET K2=0
4930       ON ERR THEN GOTO 4950
4940       RENAME F4$,F4$
4950       ON ERR THEN STOP
4960       IF SYS(7)=-48 THEN DELAY =1
4970       IF SYS(7)=-48 THEN GOTO 4930
4980       OPEN FILE[5,0],F4$,4
4990       IF I=1 THEN LET J=N1
5000       IF I=2 THEN LET J=N2
5010       LET K1=K2
5020       LET K2=P

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE 13
                       PROGRAM LISTING FOR UVVO.PO

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
5030      IF (K2-K1)>150 THEN LET K2=K1+150
5040      FOR K=K1 TO K2
5050        READ FILE[5,(J+P-K)],VO[K-K1+1]
5060      NEXT K
5070      CLOSE FILE[5]
5080      LET P3=3
5090      FOR K=K1 TO K2
5100        LET P1=G1+K/P*900
5110        LET P2=G2+VO[K-K1+1]/L*580
5120        IF I=2 THEN IF (K-INT(K/3)*3)>1 THEN LET P3=3
5130        GOSUB 8100
5140        ON ESC THEN GOTO 5360
5150        IF F5>0 THEN GOTO 5360
5160        LET P3=2
5170      NEXT K
5180      IF K2<P THEN GOTO 4930
5190    NEXT I
5200    PRINT "<7>"
5210    DELAY =.5
5220    PRINT "<7>"
5230    REM   [PAUSE AFTER PLOT]
5240    ON ERR THEN GOTO 5270
5250    TIME =60
5260    TINPUT "",A$
5270    ON ERR THEN STOF
5280    IF I3$[2,2]="T" THEN PRINT "<27><12>"
5290    IF I3$[2,2]="T" THEN GOTO 6790
5300    PRINT
5310    PRINT "<27>E"
5320    DELAY =.5
5330    PRINT "<27>H<27>J"
5340    GOTO 6790
5350    REM   [ESCAPE DURING PLOT]
5360    NOESC
5370    CLOSE
5380    LET P4$=""
5390    GOTO 5280
5400    REM ----------  PLOT LIST CURVE
5410    IF I3$[4,4]="S" THEN GOTO 5560
5420    LET L$=""
5430    IF (L2-L1)>0 THEN LET L$="FOR PLOT CURVE ",STR$(PO)," -- "
5440    LET L$=L$,"SET LISTING NANOMETER INCREMENT : "

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE 14
                       PROGRAM LISTING FOR UVVO.PO

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
5450    LET F5=3
5460    PRINT
5470    PRINT L$;I3$[5,6]
5480    GOSUB 6930
5490    ON ESC THEN GOTO 6760
5500    ON F5 THEN GOTO 5450, 5560, 6760
5510    GOSUB 7340
5520    ON ESC THEN GOTO 6760
5530    IF F5=0 THEN GOTO 6760
5540    GOTO 5450
5550    REM   [PREPARE LISTED PLOT CURVE]
5560    PRINT
5570    PRINT "PREPARING LISTED PLOT CURVE";
5580    IF (L2-L1)>0 THEN PRINT " ";STR$(PO);
5590    PRINT "."
5600    OPEN FILE[7,1],"UVVLPT"
5610    PRINT FILE[7]
5620    PRINT FILE[7]
5630    LET L$=B$[1,18],"UVVIS  SPECTROPHOTOMETRIC  ANALYSIS"
5640    PRINT FILE[7],L$
5650    LET L$=B$[1,18],"-----  -------------------  --------"
5660    PRINT FILE[7],L$
5670    PRINT FILE[7]
5680    PRINT FILE[7],L1$
5690    PRINT FILE[7],L2$
5700    PRINT FILE[7],L3$
5710    PRINT FILE[7],L4$
5720    LET L=1
5730    IF AO$="L" THEN LET L=100
5740    FOR I=1 TO S
5750      PRINT FILE[7]
5760      PRINT FILE[7]
5770      LET A$="*"
5780      LET J=N1
5790      IF I=2 THEN LET A$="!"
5800      IF I=2 THEN LET J=N2
5810      LET P1=W1-WO
5820      LET P2=VAL(I3$[5,6])
5830      LET HO$="####################"
5840      LET H1$=" PLOT CURVE IN "
5850      IF AO$="C" THEN LET H1$=H1$,"ABSORBANCE "
5860      IF AO$="L" THEN LET H1$=H1$,"% TRANSMITTANCE "

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                      PAGE 15
                   PROGRAM LISTING FOR UVV0.PO

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
5870      LET L$=" WAVE-  ABSOR-   "
5880       IF A0$="L" THEN LET L$[9,14]="  %   "
5890      LET L$=L$,H0$[1,INT((71-(LEN(L$)+LEN(H1$)))/2)],H1$
5900      LET L$=L$,H0$[1,71-LEN(L$)]
5910      PRINT FILE[7],L$
5920      LET L$="LENGTH  BANCE    0",B$[1,12],"25"
5930       IF A0$="L" THEN LET L$[9,14]="TRANS."
5940      LET L$=L$,B$[1,11],"50",B$[1,11],"75",B$[1,10],"100"
5950       IF A0$="L" THEN GOTO 6000
5960      LET L$[29,30]="0."
5970      LET L$[42,43]="0."
5980      LET L$[55,56]="0."
5990      LET L$[70,70]="."
6000      PRINT FILE[7],L$
6010      LET H0$="--------------------"
6020      LET L$=H0$[1,6],"  ",H0$[1,6],"   ",H0$,H0$,H0$[1,14]
6030      PRINT FILE[7],L$
6040      LET L$="### NM -#.####   "
6050       IF A0$="L" THEN LET L$[8,14]="-###.##"
6060      LET L$=L$,"X",B$[1,12],"X",B$[1,12],"X"
6070      LET L$=L$,B$[1,12],"X",B$[1,12],"X"
6080      LET K2=0
6090      ON ERR THEN GOTO 6110
6100      RENAME F4$,F4$
6110      ON ERR THEN STOP
6120      IF SYS(7)=-48 THEN DELAY =1
6130      IF SYS(7)=-48 THEN GOTO 6090
6140      OPEN FILE[5,0],F4$,4
6150      LET K1=K2
6160      LET K2=P1
6170      IF ((K2-K1)/P2)>150 THEN LET K2=K1+150*P2
6180      FOR K=K1 TO K2 STEP P2
6190        READ FILE[5,J+P1-K],V0[(K-K1)/P2+1]
6200      NEXT K
6210      CLOSE FILE[5]
6220      FOR K=K1 TO K2 STEP P2
6230        LET P=INT(V0[(K-K1)/P2+1]/L*52+.5)+18
6240        LET L1$=L$
6250        IF P>=17 THEN IF P<=71 THEN LET L1$[P,P]=A$
6260        PRINT FILE[7],USING L1$,(W0+K),V0[(K-K1)/P2+1]
6270      NEXT K
6280      LET K2=K+P2

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                      PAGE 16
                   PROGRAM LISTING FOR UVV0.PO

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
6290        IF K2<=P1 THEN GOTO 6090
6300      NEXT I
6310      CLOSE
6320      REM   [OUTPUT LISTED PLOT CURVE]
6330      ON ESC THEN GOTO 6760
6340      ESC
6350      ON ERR THEN GOTO 6440
6360      TIME =60
6370      PRINT
6380      PRINT "LISTED PLOT CURVE OUTPUT:"
6390      PRINT  TAB(10);"TERMINAL [1], LINEPRINTER [2], OR";
6400      TINPUT " CONTINUE [3(CR)]  >>> ",A$
6410      ON ERR THEN STOP
6420      IF LEN(A$)=0 THEN LET A$="3"
6430      ON POS(C2$,A$,1) THEN GOTO 6480, 6550, 6760
6440      ON ERR THEN STOP
6450      IF SYS(7)=60 THEN GOTO 6760
6460      PRINT "<7>"
6470      GOTO 6350
6480      ON ESC THEN GOTO 6720
6490      OPEN FILE[7,3],"UVVLPT"
6500      LREAD FILE[7],L$,W$
6510      IF EOF(7)=1 THEN GOTO 6720
6520      LET L$=L$,W$
6530      PRINT L$;
6540      GOTO 6500
6550      ON ESC THEN GOTO 6720
6560      OPEN FILE[7,3],"UVVLPT"
6570      ON ERR THEN GOTO 6650
6580      OPEN FILE[1,1],"$LPT"
6590      ON ERR THEN STOP
6600      LREAD FILE[7],L$,W$
6610      IF EOF(7)=1 THEN GOTO 6720
6620      LET L$=L$,W$
6630      PRINT FILE[1],B$[1,4];L$
6640      GOTO 6600
6650      ON ERR THEN STOP
6660      CLOSE
6670      ON ESC THEN GOTO 6720
6680      PRINT "<7>"
6690      PRINT "LINEPRINTER IN USE; WAIT FOR RETRY IN 10 SECONDS."
6700      DELAY =9

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
6710   GOTO 6550
6720   NOESC
6730   CLOSE
6740   GOTO 6330
6750   REM   [ESC DURING PLOT HEADING PREP. OR CURVE GENERATION]
6760   NOESC
6770   CLOSE
6780   REM   [CONTINUE PLOTTING PROCESS]
6790 NEXT P0
6800 DELAY =.8
6810 GOTO 1980
6820 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
6830 REM                          EXIT POINT
6840 REM
6850 NOESC
6860 PRINT
6870 CLOSE
6880 IF F3$<>"UVVO.PO" THEN BYE
6890 CHAIN F2$
6900 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
6910 REM                RESPONSE-PROCESSING SUBROUTINE
6920 REM
6930 ON ESC THEN RETURN
6940 ON ERR THEN GOTO 7000
6950 TIME =20
6960 PRINT  TAB(LEN(L$)-26);
6970 TINPUT "[KEEP(CR) OR CHANGE]  >>> ",N3$
6980 ON ERR THEN STOP
6990 GOTO 7050
7000 ON ERR THEN STOP
7010 IF SYS(7)=60 THEN GOTO 7050
7020 PRINT "<7>"
7030 PRINT "INVALID INPUT."
7040 GOTO 6940
7050 ON (F5-1) THEN GOTO 7090, 7160
7060 PRINT "<7>"
7070 PRINT "ERROR ; F5 =";F5
7080 STOP
7090 ON (LEN(N3$)+1) THEN GOTO 7110, 7130
7100 GOTO 7270
7110 LET F5=3
7120 RETURN

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
7130 IF POS(I2$,N3$,1)=0 THEN GOTO 7270
7140 LET F5=0
7150 RETURN
7160 IF LEN(N3$)>0 THEN GOTO 7190
7170 LET F5=2
7180 RETURN
7190 FOR I=1 TO LEN(N3$)
7200   IF POS(N4$,N3$[I,I],1)=0 THEN GOTO 7270
7210 NEXT I
7220 ON ERR THEN GOTO 7270
7230 IF VAL(N3$)=VAL(N3$) THEN GOTO 7240
7240 ON ERR THEN STOP
7250 LET F5=0
7260 RETURN
7270 PRINT "<7>"
7280 PRINT "INVALID INPUT."
7290 LET F5=1
7300 RETURN
7310 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
7320 REM                     VALUE-CHECK SUBROUTINE
7330 REM
7340 ON ESC THEN RETURN
7350 LET I=VAL(N3$)
7360 LET J=0
7370 IF I=1 THEN LET J=I
7380 IF I=2 THEN LET J=I
7390 IF I=5 THEN LET J=I
7400 IF I=10 THEN LET J=I
7410 IF J>0 THEN GOTO 7460
7420 PRINT "<7>"
7430 PRINT "MUST SET INCREMENT OF 1, 2, 5, OR 10 NANOMETERS."
7440 LET F5=2
7450 RETURN
7460 LET I3$[5,5]=" "
7470 LET I3$[(6-LEN(STR$(J))+1),6]=STR$(J)
7480 LET F5=1
7490 RETURN
7500 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
7510 REM               AXES-PLOTTING SUBROUTINE -- "BSCAXS.SR"
7520 REM
7530 ON ESC THEN RETURN
7540 LET F5=1

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
7550 LET P1=Q1
7560 LET P2=Q2
7570 LET P3=3
7580 GOSUB 8100
7590 IF F5>1 THEN RETURN
7600 LET P3=2
7610 IF ABS(Q5)=1 THEN GOTO 7780
7620 FOR Q6=1 TO Q3+1
7630   LET F5=1
7640   GOSUB 8100
7650   IF F5>1 THEN RETURN
7660   LET P2=P2+10*Q5/ABS(Q5)
7670   LET F5=1
7680   GOSUB 8100
7690   IF F5>1 THEN RETURN
7700   LET P2=P2-10*Q5/ABS(Q5)
7710   LET F5=1
7720   GOSUB 8100
7730   IF F5>1 THEN RETURN
7740   LET P1=P1+Q4
7750 NEXT Q6
7760 LET F5=0
7770 RETURN
7780 FOR Q6=1 TO Q3+1
7790   LET F5=1
7800   GOSUB 8100
7810   IF F5>1 THEN RETURN
7820   LET P1=P1+10*Q5/ABS(Q5)
7830   LET F5=1
7840   GOSUB 8100
7850   IF F5>1 THEN RETURN
7860   LET P1=P1-10*Q5/ABS(Q5)
7870   LET F5=1
7880   GOSUB 8100
7890   IF F5>1 THEN RETURN
7900   LET P2=P2+Q4
7910 NEXT Q6
7920 LET F5=0
7930 RETURN
7940 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
7950 REM           POINT-PLOTTING SUBROUTINE -- "BSCPLT.SR"
7960 REM

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
7970 ON ESC THEN RETURN
7980 LET F5=F5+1
7990 DIM P1$[32],P2$[32],P3$[32],P4$[4]
8000 LET P4=0
8010 LET P5=0
8020 LET P6=0
8030 LET P1$=" !<34>#$%&'()*+,-./0123456789:;<=>?"
8040 LET P2$="@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_"
8050 LET P3$="`ABCDEFGHIJKLM"
8060 LET P3$=P3$,"NOPQRSTUVWXY"
8070 LET P3$=P3$,"Z[\]^^"
8080 LET F5=F5-1
8090 RETURN
8100 ON ESC THEN RETURN
8110 LET F5=F5+1
8120 IF P3<>0 THEN GOTO 8170
8130 LET P4=P1
8140 LET P5=P2
8150 LET F5=F5-1
8160 RETURN
8170 PRINT "<29>";
8180 IF LEN(P4$)<>0 THEN PRINT P4$[4,4];
8190 LET P7=INT(P1+P4)
8200 LET P8=INT(P2+P5)
8210 IF P7>1023 THEN LET P7=1023
8220 IF P7<0 THEN LET P7=0
8230 IF P8>780 THEN LET P8=780
8240 IF P8<0 THEN LET P8=0
8250 IF P3=2 THEN LET P6=1
8260 IF P3=3 THEN LET P6=0
8270 LET P9=INT(P8/32)
8280 LET P8=P8-(P9*32)+1
8290 LET P9=P9+1
8300 LET P4$=P1$[P9,P9],P3$[P8,P8]
8310 LET P9=INT(P7/32)
8320 LET P7=P7-(P9*32)+1
8330 LET P9=P9+1
8340 LET P4$=P4$,P1$[P9,P9],P2$[P7,P7]
8350 IF P6<>0 THEN GOTO 8370
8360 PRINT "<29>";
8370 PRINT P4$
8380 LET F5=F5-1

123456789112345678921234567893123456789412345678[illegible]3456789612345678 97
         0         0         0         0         0         0         0
```

```
A-U-T-'-D    U-V-V-I-S    S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R    S-Y-S-T-E-M
9/2/1980                                                          PAGE 21
                      PROGRAM LISTING FOR UVV0.PO

12345678911234567892123456789312345678941234567895123456789612345678970
         0         0         0         0         0         0         0
8390 RETURN











































12345678911234567892123456789312345678941234567895123456789612345678970
         0         0         0         0         0         0         0
```

```
A-U-T-'-D    U-V-V-I-S    S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R    S-Y-S-T-E-M
9/2/1980                                                          PAGE 22
                                  SYMBOL TABLE FOR UVV0.PO

SYMBOL    REFERENCES
------  ----------------------------------------------------------
 0430   0190  0390  0400
 0480   0410
 0490   0550
 0510   0490
 0560   0530
 0580   0520
 0680   0620
 0810   0740
 0870   0830
 0910   0800
 0920   0980  1000
 1010   0980
 1020   1090  1110
 1120   1090  1180  1200
 1210   1010  1270  1290
 1300   1270
 1310   1360  1400
 1420   1180  1300  1360
 1500   1650
 1570   1450  1500  1930  1980  2080  2100
 1590   1700
 1660   1590
 1680   1650
 1720   1650
 1750   1790
 1770   1750
 1870   1830
 1910   1720  1860
 1980   1890  2150  2630  2660  6810
 2000   2130
 2090   2000
 2110   2080
 2150   2080
 2180   2380
 2230   2170
 2350   2180  2240  2260  2290
 2400   2340
 2450   2490
 2470   2450
 2640   2440
 2700   2400
 2740   2780
 2760   2740
 3070   3190
 3130   3170
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
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                       SYMBOL TABLE FOR UVV0.PO

SYMBOL   REFERENCES
------   ---------------------------------------------------------------

 3160    3070
 3210    3050  3140  3150
 3300    3260
 4880    4430
 4930    4970  5180
 4950    4930
 5270    5240
 5280    5390
 5360    3300  3390  3400  3460  3470  3510  3520  3580  3590  3750
         3760  3820  3830  3890  3900  3960  3970  4070  4080  4160
         4170  4250  4260  4380  4390  4510  4520  4580  4590  4630
         4640  4710  4720  4780  4790  4830  4840  5140  5150
 5410    3010
 5450    5500  5540
 5560    5410  5500
 6000    5950
 6090    6130  6290
 6110    6090
 6330    6740
 6350    6470
 6440    6350
 6480    6430
 6500    6540
 6550    6430  6710
 6600    6640
 6650    6570
 6720    6480  6510  6550  6610  6670
 6760    2720  5490  5500  5520  5530  6330  6430  6450
 6790    5290  5340
 6850    0690  0720  0860  0970  0980  1080  1090  1170  1180  1260
         1270  1350  1360  1380  1390  1570  1650  1670
 6930    0960  1070  1160  1250  1340  5480
 6940    7040
 7000    6940
 7050    6990  7010
 7090    7050
 7110    7090
 7130    7090
 7160    7050
 7190    7160
 7240    7230
 7270    7100  7130  7200  7220
 7340    1370  5510
 7460    7410
 7530    3740  3810  3880  3950
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE 24
                       SYMBOL TABLE FOR UVV0.PO

SYMBOL   REFERENCES
------   ---------------------------------------------------------------

 7780    7610
 7970    0380
 8100    3380  3450  3500  3570  4060  4150  4240  4370  4500  4570
         4620  4700  4770  4820  5130  7580  7640  7680  7720  7800
         7840  7880
 8170    8120
 8370    8350
 A$      0260  2050  2070  2080  2400  5260  5770  5790  6250  6400
         6420  6430
 A0$     0270  1620  1640  1650  1730  1740  2880  2890  3220  3990
         4000  4340  4350  4890  5730  5850  5860  5880  5930  5950
         6050
 B$      0260  0340  2580  2590  2840  2930  2960  2990  3420  5630
         5650  5920  5940  6060  6070  6630
 B0      1810  1830  2030  2160  2170  2200  2340  2800
 C$      0270  0290  1650
 C1$     0270  0300  2080
 C2$     0270  0310  6430
 D       3210  3220  3230  3780  3790  3920  3930  4280  4450
 D0      3230  4230
 F0$     0230  0450  0480  0500  0580  0730  0750  1420
 F1$     0230  0450  0590
 F2$     0230  0450  0600  0650  0670  6890
 F3$     0230  0450  0610  0620  0660  6880
 F4      0200  0460  0690
 F4$     0230  1730  4940  4980  6100  6140
 F5      0370  0400  0920  0980  1020  1090  1120  1180  1210  1270
         1310  1360  1390  3370  3400  3470  3520  3590  3760  3830
         3900  3970  4080  4170  4260  4390  4520  4590  4640  4720
         4790  4840  5150  5450  5500  5530  7050  7070  7110  7140
         7170  7250  7290  7440  7480  7540  7590  7630  7650  7670
         7690  7710  7730  7760  7790  7810  7830  7850  7870  7890
         7920  7980  8080  8110  8150  8380
 F5$     0230  1740  1760  1800  2460  2500  2750  2790
 FL#0    0580  0590  0600  0610  0650  0660  0670  0680
 FL#1    0750  0760  0770  1420  1430  1440  6580  6630
 FL#5    4980  5050  5070  6140  6190  6210
 FL#6    1800  1810  1820  2500  2540  2550  2560  2620  2790  2800
         2810  2860  2940  2950  2970  2980  3000
 FL#7    5600  5610  5620  5640  5660  5670  5680  5690  5700  5710
         5750  5760  5910  6000  6030  6260  6490  6500  6560  6600
 G$      0260  3030  3040  3110  3130  3140  3150  4430
 G1      3670  3690  3840  4130  4200  4300  4470  4680  4730  4750
         5100
 G2      3680  3700  3770  3910  4020  4210  4310  4480  4530  4550
```

```
A-U-T-'-D    U-V-V-I-S    S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R    S-Y-S-T-E-M
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                    SYMBOL TABLE FOR UVV0.PO

SYMBOL    REFERENCES
------    ---------------------------------------------------------------
          4670  5110
 H0$      0240  2540  2570  2860  2900  4330  4350  4400  5830  5890
          5900  6010  6020
 H1$      0240  2550  2580  2940  2960  2970  2990  5840  5850  5860
          5890
 H2$      0240  2560  2600  2950  2960  2980  2990
 I        0330  0340  0350  2250  2260  2270  2520  2530  2570  2610
          3550  3560  3610  3620  3630  3640  3650  4050  4090  4110
          4230  4270  4290  4360  4400  4420  4530  4540  4550  4600
          4650  4730  4740  4750  4800  4850  4910  4990  5000  5120
          5190  5740  5790  5800  6300  7190  7200  7210  7350  7370
          7380  7390  7400
 I1$      0270  0320  0930  1030  1130  1220
 I2$      0270  0930  1030  1130  1220  7130
 I3$      0270  0760  0790  0870  0950  0990  1010  1060  1100  1150
          1190  1240  1280  1300  1330  1430  1880  3010  3040  3050
          3250  3260  5280  5290  5410  5470  5820  7460  7470
 J        2530  2540  2550  2560  2850  2860  2940  2950  2970  2980
          3320  3330  3430  3530  4320  4340  4360  4450  4470  4730
          4990  5000  5050  5780  5800  6190  7360  7370  7380  7390
          7400  7410  7470
 K        3340  3350  3440  3560  4460  4530  4670  5040  5050  5060
          5090  5100  5110  5120  5170  6180  6190  6200  6220  6230
          6260  6270  6280
 K1       5010  5030  5040  5050  5090  5110  6150  6170  6180  6190
          6220  6230  6260
 K2       4920  5010  5020  5030  5040  5090  5180  6080  6150  6160
          6170  6180  6220  6280  6290
 L        2230  2240  2250  2300  4880  4890  5110  5720  5730  6230
 L$       0240  0940  0950  1040  1050  1060  1140  1150  1230  1240
          1320  1330  2510  2570  2810  2820  2830  2910  2920  2930
          3990  4000  4020  4050  4090  4120  4130  4180  5420  5430
          5440  5470  5630  5640  5650  5660  5870  5880  5890  5900
          5910  5920  5930  5940  5960  5970  5980  5990  6000  6020
          6030  6040  6050  6060  6070  6240  6500  6520  6530  6600
          6620  6630  6960
 L0       3240  3320  3670  4010
 L1       2310  2320  2340  2520  2700  3100  5430  5580
 L1$      0250  2580  2590  2600  2870  2880  2890  2900  2930  3610
          5680  6240  6250  6260
 L2       2300  2310  2340  2520  2700  3100  5430  5580
 L2$      0250  2820  2840  3620  5690
 L3$      0250  2830  2840  2960  3630  5700
 L4$      0250  2990  3640  5710
 M1       2800  2910
```

```
A-U-T-'-D    U-V-V-I-S    S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R    S-Y-S-T-E-M
9/2/1980                                                          PAGE 26
                    SYMBOL TABLE FOR UVV0.PO

SYMBOL    REFERENCES
------    ---------------------------------------------------------------
 M2       2800  2910
 M3       2800  2920
 N1       2860  4990  5780
 N2       2860  5000  5800
 N3$      0260  0990  1100  1190  1280  2160  2210  2230  2260  2280
          2300  2320  6970  7090  7130  7160  7190  7200  7230  7350
 N4$      0260  0280  2260  2280  7200
 O$       0260  1870  1880  2040
 P        2280  2300  2320  4900  5020  5050  5100  5180  6230  6250
 P0       2700  2850  3100  5430  5580  6790
 P1       3330  3430  3480  3530  4010  4130  4200  4280  4300  4470
          4660  4680  4740  4750  4800  5100  5810  6160  6190  6290
          7550  7740  7820  7860  8130  8190
 P1$      7990  8030  8300  8340
 P2       3350  3440  3560  4020  4030  4100  4140  4210  4310  4410
          4480  4540  4550  4600  4670  4860  5110  5820  6170  6180
          6190  6220  6230  6260  6280  7560  7660  7700  7900  8140
          8200
 P2$      7990  8040  8340
 P3       3360  3490  3540  4040  4220  4490  4560  4610  4690  4760
          4810  5080  5120  5160  7570  7600  8120  8250  8260
 P3$      7990  8050  8060  8070  8300
 P4       8000  8130  8190
 P4$      0260  3410  3600  4090  4180  4270  4400  5380  7990  8180
          8300  8340  8370
 P5       8010  8140  8200
 P6       8020  8250  8260  8350
 P7       8190  8210  8220  8310  8320  8340
 P8       8200  8230  8240  8270  8280  8300
 P9       8270  8280  8290  8300  8310  8320  8330  8340
 Q1       3690  3840  7550
 Q2       3700  3770  3910  7560
 Q3       3710  3780  3850  3920  7620  7780
 Q4       3720  3790  3860  3930  7740  7900
 Q5       3730  3800  3870  3940  7610  7660  7700  7820  7860
 Q6       7620  7750  7780  7910
 S        2860  4910  5740
 VOI      0250  5050  5110  6190  6230  6260
 W$       0240  0760  6500  6520  6600  6620
 W0       2860  3230  4230  4900  5810  6260
 W1       2860  3230  4230  4900  5810
```

PLOT DATA FILE STRUCTURE

A plot data file contains only a pointer and sets of percent transmittance or absorbance values.

TABLE 7. STRUCTURE OF A PLOT DATA FILE

File name: UVVOC.PF (for chlorophyll)
UVVOL.PF (for color)

File type: fixed-length binary random access

Record length: 4 bytes

File number: 5

Record	File content
0	P
1	$X_{1,W1}$
2	$X_{1,(W1-1)}$
.	.
.	.
.	.
(W1-W0-1)	$X_{1,W0}$
(W1-W0)	$X_{2,W1}$
(W1-W0+1)	$X_{2,(W1-1)}$
.	.
.	.
.	.
(P-1)	$X_{N,W0}$

Where:

P is pointer to next available record
W1, W0 are upper and lower scan range wavelength bounds
N is the number of sets of plot data
$X_{I,J}$ is the percent transmittance or absorbance value of the Ith set of plot data at J nanometers

PLOT REFERENCE FILE STRUCTURE

The plot reference file contains blocks of information relevant to each plot. Each block also contains a pointer or pointers to the raw data found in the corresponding plot data file. Concerning the headings mentioned below, more detailed explanations of their content may be found in the file structures sections for chlorophyll and color.

TABLE 8. STRUCTURE OF A PLOT REFERENCE FILE

File name: UVVOC.PR (for chlorophyll)
UVVOL.PR (for color)

File type: fixed-length binary random access

Record length: 41 bytes

File number: 6

Record	File content
0	N,D1,D2,D3
1	N$
2	H0$,W0,W1,P,P1,P2
3	H1$
4	H2$
5	H3$
6	H4$
7	H0$,W0,W1,P,P1,P2
.	.
.	.
.	.
$\left(\left[(N-1)*5\right]+2\right)$	H0$,W0,W1,P,P1,P2

Note: the jth plot reference file block begins at record $\left(\left[(j-1)*5\right]+2\right)$

Where:

N is number of plot reference file blocks
D1-D3 is month, day, and year of analysis
N$ is names, where: characters 1-20 are analyst's name, and remaining characters are instrument type
H0$ is minor sample heading
W0, W1 are lower and upper scan range wavelength bounds
P is number of scans per plot
P1 is plot data file record pointer to ith set of scan data
P2 is plot data file record pointer to (i+1)th set of scan data
H1$,H2$,H3$,H4$ are the four major plot headings

SECTION 5

SPECTROPHOTOMETER QUALITY ASSURANCE (SQA) ANALYSIS

The SQA analysis is composed of three modules. UVVO.Q1 is the main command module from which the transmittance calibration module may be called, and wherein quality control standards may be updated. UVVO.Q2 takes care of filter scans, data reduction, and replicate deletion. Both of these modules may access the report module, UVVO.Q3 which prepares and outputs either a summary or an intermediate report, and chains back to the calling program.

SQA ANALYSIS MODULE -- UVVO.Q1

UVVO.Q1 is chained to from UVVO.OO or from any of its called modules (UVVO.TO, UVVO.Q1, or UVVO.Q2). After the retrieval of system status and wavelength calibration parameters, the existence of the permanent files is checked. Should either the 30-Selected-Ordinate method file (UVVOO.SF) or the NBS certified values file (UVVOQ.VF) be non-existent or of an improper form, then an error message is issued, error parameters are written to the system status transfer file, and a chain to UVVO.OO is made via the program exit point.

The SQA analysis command line is displayed. One of the commands is received and a branch is made to the appropriate section of code.

For transmittance calibration, the file UVVOQ.CF is examined. An improperly defined scan speed provokes a message and prevents the operation. Otherwise, the scan range wavelength bounds are written to the file, the "destination" program is defined as UVVO.TO, and a branch is made to the program exit point.

The scanning mechanism speed may be checked or set. This portion of code is described in the section on the Scanning Mechanism Speed Checking/Setting Routine.

In the SQA analysis summary report section, the number of filters analyzed is discovered from the data summary file UVVOQ.DS. Should this number not be greater than zero, the operation is refused. Otherwise, the "destination" program name is defined as UVVO.Q3 (the report module) and a branch made to the program exit point.

For filter analysis, the existence of a proper transmittance calibration file is sought. If the file doesn't exist, the filter analysis operation is denied. Otherwise, for the first filter of the run, the data summary file is initialized, and if necessary, also the SQA historical standards file UVVOQ.SF.

To continue preparations for filter analysis, the filter number is received. Filter numbers and their corresponding designations may be displayed by first consulting the NBS certified values file. The filter number, replicate counter, and replicate record pointer are written to a filter header record of the data summary file. The filter number will have been made negative for a tristimulus filter, which is clued by a marker in the NBS certified values file. (See FILE STRUCTURES.) The "destination" program is defined as UVVO.Q2, and a branch made to the program exit point.

In the standards update section, options are presented for: 1) listing of filters analyzed; 2) update by filter designation; and 3) update by list number. Option 1 must necessarily precede option 3. A list number update is performed only if that data has not already been added to the SQA historical standards file UVVOQ.SF. A filter designation update is not performed if the designation is invalid or if all filters of that designation have already been added to the standards file. When, for a filter designation update, more than one filter analysis of the same designation has been made, then only the oldest filter which has not yet been included in the standards file is added.

The standards update process begins with a transfer of all undeleted replicates of the filter to the standards file. Since a limit of twenty-five replicates is maintained in the standards file, any additional replicates in excess of this limit are written over the oldest replicate data, and the "oldest" replicate position pointer is redefined.

The ending section begins with setting the number of filters analyzed in the data summary file to -9999. The "destination" program is defined as UVVO.OO, and control drops down to the exit point.

At the program exit point, the modified program location variables are written to the system status transfer file. The module then chains to the "destination" program.

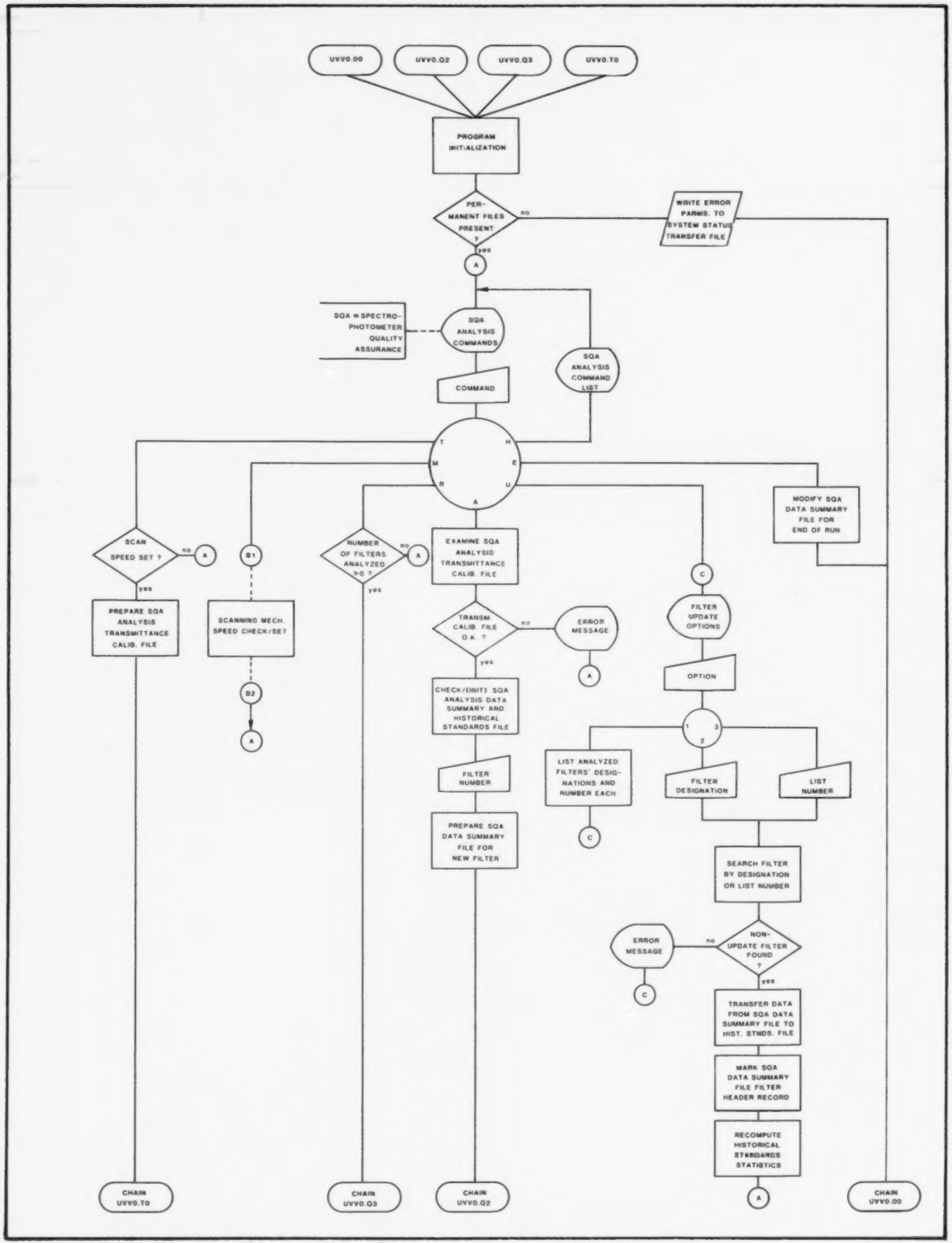
UVV0.00
UVV0.Q2
UVV0.Q3
UVV0.T0
PROGRAM INITIALIZATION
PER-MANENT FILES PRESENT ?
no
yes
WRITE ERROR PARMS. TO SYSTEM STATUS TRANSFER FILE
A
SQA = SPECTRO-PHOTOMETER QUALITY ASSURANCE
SQA ANALYSIS COMMANDS
SQA ANALYSIS COMMAND LIST
COMMAND
T
H
M
E
R
U
A
SCAN SPEED SET ?
no
A
yes
PREPARE SQA ANALYSIS TRANSMITTANCE CALIB. FILE
B1
SCANNING MECH. SPEED CHECK/SET
B2
A
NUMBER OF FILTERS ANALYZED >0 ?
no
A
yes
EXAMINE SQA ANALYSIS TRANSMITTANCE CALIB. FILE
TRANSM. CALIB. FILE O.K. ?
no
ERROR MESSAGE
A
yes
CHECK/(INIT) SQA ANALYSIS DATA SUMMARY AND HISTORICAL STANDARDS FILE
FILTER NUMBER
PREPARE SQA DATA SUMMARY FILE FOR NEW FILTER
MODIFY SQA DATA SUMMARY FILE FOR END OF RUN
C
FILTER UPDATE OPTIONS
OPTION
1
2
3
LIST ANALYZED FILTERS' DESIG-NATIONS AND NUMBER EACH
C
FILTER DESIGNATION
LIST NUMBER
SEARCH FILTER BY DESIGNATION OR LIST NUMBER
ERROR MESSAGE
no
NON-UPDATE FILTER FOUND ?
C
yes
TRANSFER DATA FROM SQA DATA SUMMARY FILE TO HIST. STNDS. FILE
MARK SQA DATA SUMMARY FILE FILTER HEADER RECORD
RECOMPUTE HISTORICAL STANDARDS STATISTICS
A
CHAIN UVV0.T0
CHAIN UVV0.Q3
CHAIN UVV0.Q2
CHAIN UVV0.00

Figure 5. Flowchart of module UVV0.Q1.

TABLE 9. VARIABLE DESCRIPTIONS FOR MODULE UVVO.Q1

A$	a single-character user-response variable
AO$	the spectrophotometer quality assurance analysis (SQA) command
A2	an accumulator used by CALL 257
C$	the SQA analysis command line
C2	the CALL 257 indicator number for scan-clear (i.e. stop)
C5	the transmittance signal channel number
C6	the wavelength signal channel number
C7	the CALL 7 channel-indicator number
D7	the CALL 7 initial time delay (in sixtieth seconds)
D8	the CALL 7 between-signal pairs time delay (in sixtieth seconds)
FO	the system status parameter run-mode flag
F1	the system status parameter error flag: see Table 1
FO$	a file name variable
F1$, F2$, F3$	program location variables; see Table 1
F5	a flag used during program initialization
H	a loop-counter variable
HO	the number of sets of scan data for a particular filter in the historical standards file; HO never exceeds 25
H1	the pointer to the first set of scan data of a particular filter in the historical standards file
I, J, J1, K, L	loop-counter and general-purpose variables
M	the marker (first item) of each filter header record in the data summary file, where: M = 0 for data not added to historical standards file M = -9999 for data already added to historical stnds. file
MO	an indicator constant of value -9999; various applications
M1, M2, M3	the date of the SQA analysis session (month, day, year)
M()	the results for a particular filter replicate
NO	the filter number (corresponding to its designation)
NO$	the filter designation
N7	the number of A/D counts to be put in the VO scan array
P	a branching and general-purpose variable
PO	the replicate counter (number of scans of a filter)
P1	the replicate pointer (to next available record in UVVOQ.DS)
P2	the pointer to a filter header record in file UVVOQ.SF
Q1, Q2, Q3	the constants of the wavelength calibration equation
R	the computed scan speed (in nanometers per minute)
RO	the expected scan speed (in nanometers per minute)
S$	the filter designation of the filter data to be added to the historical standards file

TABLE 9. (continued)

S0	the filter counter (number of filters analyzed)
S1	the filter pointer (to next header record in UVVOQ.DS)
S()	the standard deviations of the U means
T()	the NBS certified values for a particular filter
U()	the means of the historical standards values
V$	an output character string
V0()	the CALL 7 storage array
W, X, Y	general-purpose variables usually representing wavelength
W0, W1	the lower and upper scan range wavelength bounds

```
A-U-T-´-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
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                      PROGRAM LISTING FOR UVV0.Q1

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0010 REM           ++++++++++++++++++++++++++++++++++++++++
0020 REM           +    AUTOMATED  ULTRAVIOLET-VISIBLE    +
0030 REM           +       SPECTROPHOTOMETER SYSTEM       +
0040 REM           +    SPECTROPHOTOMETER QUALITY ASSU-   +
0050 REM           +    RANCE ANALYSIS MODULE: UVV0.Q1    +
0060 REM           +    WRITTEN BY GREG ROTH (5/16/80)    +
0070 REM           +    UNIV. OF CINCI. COMPUTER CENTER   +
0080 REM           ++++++++++++++++++++++++++++++++++++++++
0090 REM
0100 REM
0110 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0120 REM                   PROGRAM INITIALIZATION
0130 REM
0140 REM ----------  SET PAGE/ESC/ROUTE-FLAG
0150 PAGE =72
0160 ON ESC THEN GOTO 0270
0170 LET F5=0
0180 ESC
0190 REM ----------  DIM/INIT STRING VARS. AND ARRAYS
0200 DIM F0$[13],F1$[13],F2$[13],F3$[13]
0210 DIM C$[7],N0$[5],S$[5],A0$[1],A$[2],V$[5]
0220 DIM M[5],S[5],U[5],V0[22]
0230 LET C$="TMRAUEH"
0240 LET M0=-9999
0250 GOTO 0320
0260 REM ----------  ESCAPE DURING INITIALIZATION
0270 NOESC
0280 CLOSE
0290 DIM F0$[13],F1$[13],F2$[13],F3$[13]
0300 LET F5=1
0310 REM ----------  RETRIEVE SYSTEM STATUS PARMS.
0320 LET F0$="UVV00.TR"
0330 OPEN FILE[0,0],F0$,21
0340 READ FILE[0,0],F0,F1
0350 READ FILE[0,1],F1$
0360 READ FILE[0,2],F2$
0370 READ FILE[0,3],F3$
0380 READ FILE[0,6],C5,C6,C7
0390 CLOSE FILE[0]
0400 REM   [MODIFY PROGRAM LOCATION VARS.]
0410 LET F1$=F2$
0420 LET F2$=F3$

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-´-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                        PAGE 2
                      PROGRAM LISTING FOR UVV0.Q1

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0430 LET F3$=""
0440 IF F5=1 THEN GOTO 5240
0450 REM ----------  RETRIEVE WAVELENGTH CALIBRATION DATA
0460 ON ESC THEN GOTO 5240
0470 LET F0$="UVV00.CF"
0480 OPEN FILE[1,0],F0$,20
0490 READ FILE[1,1],Q1,Q2,Q3
0500 CLOSE FILE[1]
0510 REM ----------  VERIFY EXISTANCE OF PERMANENT FILES
0520 LET S[1]=8
0530 LET S[2]=28
0540 FOR I=1 TO 2
0550   IF I=1 THEN LET F0$="UVV00.SF"
0560   IF I=2 THEN LET F0$="UVV0Q.VF"
0570   MAT M=ZER
0580   OPEN FILE[I,0],F0$,S[I]
0590   READ FILE[I,0],M[1],M[2]
0600   CLOSE FILE[I]
0610   IF (M[1]+M[2])<>1 THEN GOTO 0650
0620 NEXT I
0630 GOTO 0880
0640 REM   [NON-EXISTENT PERMANENT FILE UNCOVERED]
0650 NOESC
0660 LET F0$="UVV00.TR"
0670 OPEN FILE[0,0],F0$,21
0680 LET F1=1
0690 LET P=-10
0700 WRITE FILE[0,0],F0,F1
0710 WRITE FILE[0,7],SYS(2),SYS(1),SYS(11),SYS(12),P
0720 CLOSE FILE[0]
0730 GOTO 5240
0740 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0750 REM          SPECTROPHOTOMETER QUALITY ASSURANCE (SQA)
0760 REM                   ANALYSIS COMMAND LEVEL
0770 REM
0780 REM ----------  SQA ANALYSIS COMMAND LIST
0790 ON ESC THEN GOTO 0880
0800 PRINT
0810 PRINT "T  ---  TRANSMITTANCE CALIBRATION: CHECK AND/OR SET"
0820 PRINT "M  ---  SCANNING MECHANISM SPEED: CHECK AND/OR SET"
0830 PRINT "R  ---  SUMMARY SPECTRO. QUALITY ASSURANCE REPORT"
0840 PRINT "A  ---  ANALYSIS OF ONE FILTER"

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                      PAGE  3
                     PROGRAM LISTING FOR UVV0.01

 1234567891123456789212345678931234567894123456789512345678961234567897
          0         0         0         0         0         0         0
 0850 PRINT "U  ---  UPDATE OF HISTORICAL STANDARDS WITH ANALYSIS DATA"
 0860 PRINT "E  ---  END OF ANALYSIS SESSION"
 0870 REM ----------  SQA ANALYSIS COMMAND LIST
 0880 ON ESC THEN GOTO 5240
 0890 ESC
 0900 ON ERR THEN GOTO 0980
 0910 PRINT
 0920 PRINT
 0930 PRINT "QUALITY ASSURANCE COMMANDS:  T, M, R, A, U, E, H(CR)";
 0940 INPUT "  >>> ",A0$
 0950 ON ERR THEN STOP
 0960 IF LEN(A0$)=0 THEN LET A0$="H"
 0970 ON POS(C$,A0$,1) THEN GOTO 1050, 1320, 2430, 2620, 3800, 5240, 07
*     90
 0980 ON ERR THEN STOP
 0990 PRINT "<7>"
 1000 PRINT "INVALID COMMAND.";
 1010 GOTO 0900
 1020 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 1030 REM       TRANSMITTANCE CALIBRATION CHECK/SET SECTION
 1040 REM
 1050 ON ESC THEN GOTO 1210
 1060 LET F0$="UVV0Q.CF"
 1070 LET R=0
 1080 OPEN FILE[2,0],F0$,8
 1090 ON ERR THEN GOTO 1240
 1100 READ FILE[2,0],I,J
 1110 READ FILE[2,1],I,R
 1120 ON ERR THEN STOP
 1130 IF R<=0 THEN GOTO 1240
 1140 LET W1=700
 1150 LET W0=400
 1160 WRITE FILE[2,2],W1,W0
 1170 CLOSE FILE[2]
 1180 NOESC
 1190 LET F3$="UVV0.T0"
 1200 GOTO 5330
 1210 NOESC
 1220 CLOSE
 1230 GOTO 0880
 1240 NOESC
 1250 CLOSE

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                      PAGE  4
                     PROGRAM LISTING FOR UVV0.01

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
1260 PRINT "<7>"
1270 PRINT "SCAN MECHANISM SPEED NOT SET OR IMPROPER."
1280 GOTO 0880
1290 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
1300 REM       SCANNING MECH. SPEED CHECK/SET SECTION
1310 REM
1320 ON ESC THEN GOTO 1430
1330 LET D7=0
1340 LET D8=60
1350 LET R=0
1360 LET F0$="UVV0Q.CF"
1370 OPEN FILE[2,0],F0$,8
1380 ON ESC THEN GOTO 1430
1390 ON ERR THEN GOTO 1460
1400 READ FILE[2,1],I,R
1410 CLOSE FILE[2]
1420 GOTO 1510
1430 NOESC
1440 CLOSE FILE[2]
1450 GOTO 0880
1460 ON ERR THEN STOP
1470 NOESC
1480 LET R=0
1490 CLOSE FILE[2]
1500 REM ----------  SCANNING MECH. SPEED OPTION-SELECT
1510 ON ESC THEN GOTO 0880
1520 ESC
1530 ON ERR THEN GOTO 1610
1540 PRINT
1550 PRINT "SCAN MECH. SPEED:  ";
1560 INPUT "CHECK[1], SET[2], OR CONTINUE[3(CR)]  >>> ",A$
1570 ON ERR THEN STOP
1580 IF LEN(A$)=0 THEN LET A$="3"
1590 LET P=POS("123",A$,1)
1600 ON P THEN GOTO 1660, 1660, 0880
1610 ON ERR THEN STOP
1620 PRINT "<7>"
1630 PRINT "PLEASE ENTER 1, 2, OR 3(CR)"
1640 GOTO 1530
1650 REM ----------  SCAN MECH. SPEED CHECK/SET INSTRS.
1660 ON ESC THEN GOTO 2270
1670 LET V$="CHECK"

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-´-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                            PAGE  5
                       PROGRAM LISTING FOR UVV0.Q1

 1234567891123456789212345678931234567894123456789512345678961234567897
          0         0         0         0         0         0         0
 1680 IF P=2 THEN LET V$="SET"
 1690 PRINT
 1700 PRINT "SCANNING MECHANISM SPEED ";V$;":"
 1710 PRINT  TAB(10);"1.  SET WAVELENGTH AT SCANNING MID-RANGE."
 1720 PRINT  TAB(10);"2.  SET SPECTRO. FOR SCAN OPERATION AND ";
 1730 ON ERR THEN GOTO 1770
 1740 INPUT "PRESS CR KEY. ",A$
 1750 ON ERR THEN STOP
 1760 IF LEN(A$)=0 THEN GOTO 1810
 1770 ON ERR THEN STOP
 1780 PRINT "<7>"
 1790 PRINT  TAB(14);
 1800 GOTO 1730
 1810 LET N7=2+P*10
 1820 ON ESC THEN GOTO 2310
 1830 CALL 7,C7,D7,D8,N7,V0[1]
 1840 ON ESC THEN GOTO 2270
 1850 IF P=2 THEN GOTO 1960
 1860 REM   [SCAN SPEED CHECK RESULTS]
 1870 LET W=Q1+V0[4]*(Q2+Q3*V0[4])
 1880 LET Y=Q1+V0[12]*(Q2+Q3*V0[12])
 1890 LET R0=INT(((W-Y)*15)/5+.5)*5
 1900 PRINT
 1910 PRINT USING "EXPECTED SPEED: ### NM/MIN  ",R;
 1920 PRINT USING "MEAS´D SPEED: ### NM/MIN  ",R0;
 1930 PRINT USING "DIFF: -### NM/MIN",(R0-R)
 1940 GOTO 1510
 1950 REM   [SCAN SPEED SET RESULTS]
 1960 LET W=Q1+V0[6]*(Q2+Q3*V0[6])
 1970 LET X=Q1+V0[14]*(Q2+Q3*V0[14])
 1980 LET Y=Q1+V0[22]*(Q2+Q3*V0[22])
 1990 LET W=(W-X)*15
 2000 LET Y=(X-Y)*15
 2010 LET X=ABS(Y-W)/((Y+W)/2)
 2020 IF X<5E-02 THEN GOTO 2070
 2030 PRINT "<7>"
 2040 PRINT "MEASURED SCAN SPEED VARIED FROM ";
 2050 PRINT USING "###.## NM/MIN  TO  ###.## NM/MIN",W,Y
 2060 GOTO 1510
 2070 LET R=(W+Y)/2
 2080 LET R=INT(R/5+.5)*5
 2090 PRINT

 1234567891123456789212345678931234567894123456789512345678961234567897
          0         0         0         0         0         0         0
```

```
A-U-T-´-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                            PAGE  6
                       PROGRAM LISTING FOR UVV0.Q1

 1234567891123456789212345678931234567894123456789512345678961234567897
          0         0         0         0         0         0         0
 2100 PRINT "MEASURED SCAN SPEED IS APPROX.";R;"NM/MIN."
 2110 ON ERR THEN GOTO 2180
 2120 PRINT
 2130 INPUT "IGNORE NEWLY SET SCAN SPEED ?  [N(CR) OR Y]  >>> ",A$
 2140 ON ERR THEN STOP
 2150 IF LEN(A$)=0 THEN GOTO 2210
 2160 IF A$="N" THEN GOTO 2210
 2170 IF A$="Y" THEN GOTO 1510
 2180 ON ERR THEN STOP
 2190 PRINT "<7>"
 2200 GOTO 2110
 2210 OPEN FILE[2,0],F0$,8
 2220 ON ESC THEN GOTO 2270
 2230 WRITE FILE[2,1],SYS(3),R
 2240 CLOSE FILE[2]
 2250 GOTO 1510
 2260 REM   [ESC FROM SCAN CHECK/SET]
 2270 NOESC
 2280 CLOSE
 2290 GOTO 1510
 2300 REM   [ESC FROM CALL 7]
 2310 LET C2=24823
 2320 LET A2=0
 2330 ON ERR THEN GOTO 2370
 2340 CALL 257,C2,A2
 2350 ON ERR THEN STOP
 2360 GOTO 1510
 2370 PRINT "<7>"
 2380 PRINT "ERROR IN CALL 257 SCAN-STOP."
 2390 GOTO 1510
 2400 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 2410 REM                 SQA ANALYSIS SUMMARY REPORT SECTION
 2420 REM
 2430 ON ESC THEN GOTO 2560
 2440 LET F0$="UVV0Q.DS"
 2450 OPEN FILE[4,0],F0$,20
 2460 LET S0=0
 2470 READ FILE[4,0],S0
 2480 CLOSE FILE[4]
 2490 IF S0>0 THEN IF S0=INT(S0) THEN GOTO 2530
 2500 PRINT "<7>"
 2510 PRINT "NO FILTER DATA AVAILABLE."

 1234567891123456789212345678931234567894123456789512345678961234567897
          0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVV0.Q1

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2520 GOTO 0880
2530 NOESC
2540 LET F3$="UVV0.Q3"
2550 GOTO 5330
2560 NOESC
2570 CLOSE
2580 GOTO 0880
2590 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
2600 REM                 SQA FILTER ANALYSIS SECTION
2610 REM
2620 ON ESC THEN GOTO 3670
2630 REM ----------  VERIFY EXISTENCE OF TRANS. CALIB. FILE
2640 LET F0$="UVV0Q.CF"
2650 ON ERR THEN GOTO 3710
2660 OPEN FILE[2,0],F0$,8
2670 READ FILE[2,1],I,R
2680 READ FILE[2,2],W1,W0
2690 READ FILE[2,(W1-W0+2)],I,J
2700 READ FILE[2,(W1-W0+3)],I,J
2710 CLOSE FILE[2]
2720 ON ERR THEN STOP
2730 REM ---------- RETRIEVE NBS STANDARDS PARMS.
2740 LET F0$="UVV0Q.VF"
2750 OPEN FILE[3,0],F0$,28
2760 READ FILE[3,0],I,J,L
2770 REM ----------  CHECK/(INIT) DATA SUMMARY FILE
2780 LET F0$="UVV0Q.DS"
2790 LET S0=0
2800 OPEN FILE[4,0],F0$,20
2810 READ FILE[4,0],S0
2820 CLOSE FILE[4]
2830 IF S0>0 THEN GOTO 3130
2840 ON ERR THEN GOTO 2860
2850 DELETE F0$
2860 ON ERR THEN STOP
2870 OPEN FILE[4,0],F0$,20
2880 LET S0=0
2890 LET S1=1
2900 WRITE FILE[4,0],S0,S1,SYS(2),SYS(1),SYS(3)
2910 CLOSE FILE[4]
2920 REM ----------  CHECK/(INIT) HIST. STANDARDS DATA FILE
2930 LET F0$="UVV0Q.SF"

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVV0.Q1

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2940 LET I=0
2950 LET J=0
2960 OPEN FILE[5,0],F0$,20
2970 READ FILE[5,0],I,J
2980 IF (I+J)=1 THEN CLOSE FILE[5]
2990 IF (I+J)=1 THEN GOTO 3130
3000 MAT M=ZER
3010 LET M[1]=1
3020 WRITE FILE[5,0],M[1],M[2],M[3],M[4],M[5]
3030 FOR I=1 TO L
3040   LET J=1+28*(I-1)
3050   LET M[1]=1
3060   FOR K=0 TO 2
3070     WRITE FILE[5,(J+K)],M[2],M[1],M[3],M[4],M[5]
3080     LET M[1]=0
3090   NEXT K
3100 NEXT I
3110 CLOSE FILE[5]
3120 REM ----------  RETRIEVE FILTER NUMBER
3130 ON ESC THEN GOTO 3670
3140 ON ERR THEN GOTO 3250
3150 PRINT
3160 PRINT "SELECT FILTER [1 TO ";STR$(L);"] OR H(CR)";
3170 INPUT "  >>> ",A$
3180 ON ERR THEN STOP
3190 IF LEN(A$)=0 THEN GOTO 3300
3200 IF A$="H" THEN GOTO 3300
3210 ON ERR THEN GOTO 3250
3220 LET I=VAL(A$)
3230 ON ERR THEN STOP
3240 IF I>=1 THEN IF I<=L THEN IF I=INT(I) THEN GOTO 3390
3250 ON ERR THEN STOP
3260 PRINT "<7>"
3270 PRINT "PLEASE ENTER SINGLE NUMBER OR TYPE H(CR)."
3280 GOTO 3140
3290 REM   [LIST FILTERS]
3300 ON ESC THEN GOTO 3130
3310 PRINT
3320 PRINT "FILTER    DESIGNATION"
3330 FOR I=1 TO L
3340   READ FILE[3,I],NO$
3350   PRINT USING "  ##          #####",I,NO$

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
3360 NEXT I
3370 GOTO 3130
3380 REM   [PREPARE DATA SUMMARY FILE]
3390 ON ESC THEN GOTO 3130
3400 READ FILE[3,I],NO$
3410 ON ERR THEN GOTO 3490
3420 PRINT
3430 PRINT "ANALYZE FILTER ";NO$;
3440 INPUT ".   MISTAKE ?  [N(CR) OR Y] ",A$
3450 ON ERR THEN STOP
3460 IF LEN(A$)=0 THEN GOTO 3520
3470 IF A$="N" THEN GOTO 3520
3480 IF A$="Y" THEN GOTO 3140
3490 ON ERR THEN STOP
3500 PRINT "<7>"
3510 GOTO 3410
3520 LET F0$="UVV0Q.DS"
3530 OPEN FILE[4,0],F0$,20
3540 READ FILE[3,I],NO$,T[1],T[2],T[3],T[4],T[5]
3550 READ FILE[4,0],S0,S1
3560 LET M=0
3570 LET NO=I
3580 IF T[4]=M0 THEN LET NO=-NO
3590 LET P0=0
3600 LET P1=S1+3
3610 WRITE FILE[4,S1],M,NO,P0,P1
3620 NOESC
3630 CLOSE
3640 LET F3$="UVV0.Q2"
3650 GOTO 5330
3660 REM ----------  ESCAPE DURING SQA FILT. ANALY. SECT.
3670 NOESC
3680 CLOSE
3690 GOTO 0880
3700 REM ----------  BAD TRANS. CALIB. FILE
3710 NOESC
3720 ON ERR THEN STOP
3730 CLOSE
3740 PRINT "<7>"
3750 PRINT "INSUFFICIENT TRANSMITTANCE CALIBRATION DATA."
3760 GOTO 0880
3770 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
3780 REM             HISTORICAL STANDARDS UPDATE SECTION
3790 REM
3800 ON ESC THEN GOTO 5180
3810 ESC
3820 ON ERR THEN GOTO 3910
3830 PRINT
3840 PRINT "STANDARDS UPDATE:";
3850 PRINT "  LIST FILTERS[1], UPDATE BY DESIGNATION[2],"
3860 PRINT  TAB(19);"UPDATE BY LIST NUMBER[3], CONTINUE [4(CR)]";
3870 INPUT "  >>> ",A$
3880 ON ERR THEN STOP
3890 IF LEN(A$)=0 THEN LET A$="4"
3900 ON POS("1234",A$,1) THEN GOTO 3960, 4140, 4140, 5180
3910 ON ERR THEN STOP
3920 PRINT "<7>"
3930 PRINT "PLEASE ENTER 1, 2, 3, OR 4."
3940 GOTO 3820
3950 REM ----------  LIST FILTERS
3960 ON ESC THEN GOTO 4100
3970 LET F0$="UVV0Q.VF"
3980 OPEN FILE[3,0],F0$,28
3990 LET F0$="UVV0Q.DS"
4000 OPEN FILE[4,0],F0$,20
4010 READ FILE[4,0],S0,S1
4020 LET P1=1
4030 PRINT
4040 PRINT "FILTER   DESIGNATION   # OF REP'S"
4050 FOR I=1 TO S0
4060   READ FILE[4,P1],M,NO,P0,P1
4070   READ FILE[3,ABS(NO)],NO$
4080   PRINT USING "  ##        #####       ##",I,NO$,P0
4090 NEXT I
4100 NOESC
4110 CLOSE
4120 GOTO 3800
4130 REM ----------  UPDATE STANDARDS
4140 ON ESC THEN GOTO 5140
4150 IF A$="3" THEN GOTO 4260
4160 REM   [GET FILTER DESIGNATION]
4170 ON ERR THEN GOTO 4220
4180 PRINT
4190 INPUT "ENTER FILTER DESIGNATION  >>> ",S$

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                         PAGE 11
                      PROGRAM LISTING FOR UVV0.01

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
4200 ON ERR THEN STOP
4210 IF LEN(S$)>0 THEN GOTO 4370
4220 ON ERR THEN STOP
4230 PRINT "<7>"
4240 GOTO 4170
4250 REM   [GET LIST NUMBER]
4260 ON ERR THEN GOTO 4320
4270 PRINT
4280 PRINT "ENTER LIST NUMBER [1 TO ";STR$(S0);"]";
4290 INPUT "  >>> ",L
4300 ON ERR THEN STOP
4310 IF L>=1 THEN IF L<=S0 THEN IF L=INT(L) THEN GOTO 4370
4320 ON ERR THEN STOP
4330 PRINT "<7>"
4340 PRINT "PLEASE ENTER SINGLE NUMBER."
4350 GOTO 4260
4360 REM   [PERFORM UPDATE]
4370 LET F0$="UVV00.VF"
4380 OPEN FILE[3,0],F0$,28
4390 LET F0$="UVV00.DS"
4400 OPEN FILE[4,0],F0$,20
4410 LET S0=0
4420 READ FILE[4,0],S0,S1,M1,M2,M3
4430 LET K=0
4440 LET J=VAL(A$)
4450 LET P1=1
4460 FOR I=1 TO S0
4470   LET J1=P1
4480   READ FILE[4,J1],M,N0,P0,P1
4490   READ FILE[3,ABS(N0)],N0$
4500   IF J=2 THEN IF S$=N0$ THEN LET K=I
4510   IF J=3 THEN IF I=L THEN LET K=I
4520   IF K=I THEN IF M<>M0 THEN GOTO 4590
4530 NEXT I
4540 CLOSE
4550 PRINT "<7>"
4560 IF K=0 THEN PRINT "FILTER DATA NOT FOUND."
4570 IF K>0 THEN PRINT "FILTER DATA ALREADY ADDED TO STANDARDS."
4580 GOTO 3800
4590 CLOSE FILE[3]
4600 LET F0$="UVV00.SF"
4610 OPEN FILE[5,0],F0$,20

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                         PAGE 12
                      PROGRAM LISTING FOR UVV0.01

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
4620 LET L=5
4630 IF N0<0 THEN LET L=3
4640 LET P2=1+28*(ABS(N0)-1)
4650 READ FILE[5,P2],H0,H1
4660 LET J=J1+2
4670 LET K=H1+H0
4680 LET K=K-INT((K-1)/25)*25
4690 FOR I=1 TO P0
4700   LET J=J+1
4710   READ FILE[4,J],M[1],M[2],M[3],M[4],M[5]
4720   IF M[1]=M0 THEN GOTO 4700
4730   WRITE FILE[5,(P2+2+K)],M[1],M[2],M[3],M[4],M[5]
4740   LET K=(K+1)-INT(K/25)*25
4750 NEXT I
4760 WRITE FILE[4,J1],M0,N0,P0,P1
4770 LET J=H0+P0
4780 IF J>25 THEN LET J=25
4790 LET H1=H1+(H0+P0-J)
4800 LET H1=H1-INT((H1-1)/25)*25
4810 LET H0=J
4820 WRITE FILE[5,P2],H0,H1,M1,M2,M3
4830 CLOSE FILE[4]
4840 PRINT
4850 PRINT "FILTER DATA ADDED TO HISTORICAL STANDARDS FILE."
4860 LET J=H1
4870 LET K=P2+2
4880 MAT U=ZER
4890 MAT S=ZER
4900 FOR I=1 TO H0
4910   READ FILE[5,(K+J)],M[1],M[2],M[3],M[4],M[5]
4920   FOR H=1 TO L
4930     LET U[H]=((I-1)/I*U[H])+(M[H]/I)
4940   NEXT H
4950   LET J=(J+1)-INT(J/25)*25
4960 NEXT I
4970 IF H0=1 THEN GOTO 5090
4980 LET J=H1
4990 FOR I=1 TO H0
5000   READ FILE[5,(K+J)],M[1],M[2],M[3],M[4],M[5]
5010   FOR H=1 TO L
5020     LET S[H]=S[H]+(U[H]-M[H])^2
5030   NEXT H

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE 13
                     PROGRAM LISTING FOR UVV0.Q1

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
5040   LET J=(J+1)-INT(J/25)*25
5050 NEXT I
5060 FOR H=1 TO L
5070   LET S[H]=SQR(S[H]/(H0-1))
5080 NEXT H
5090 WRITE FILE[5,(P2+1)],U[1],U[2],U[3],U[4],U[5]
5100 WRITE FILE[5,(P2+2)],S[1],S[2],S[3],S[4],S[5]
5110 CLOSE FILE[5]
5120 GOTO 0880
5130 REM ----------  ESCAPE DURING UPDATE PROCESS
5140 NOESC
5150 CLOSE
5160 GOTO 3800
5170 REM ----------  ESCAPE DURING UPDATE OPT-SELECT
5180 NOESC
5190 CLOSE
5200 GOTO 0880
5210 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
5220 REM                 SQA ANALYSIS ENDING SECTION
5230 REM
5240 NOESC
5250 CLOSE
5260 LET F0$="UVV0Q.DS"
5270 OPEN FILE[4,0],F0$,20
5280 READ FILE[4,0],S0,S1,M1,M2,M3
5290 WRITE FILE[4,0],M0,S1,M1,M2,M3
5300 CLOSE FILE[4]
5310 LET F3$="UVV0.00"
5320 REM ----------  EXIT POINT
5330 LET F0$="UVV00.TR"
5340 OPEN FILE[0,0],F0$,21
5350 WRITE FILE[0,1],F1$
5360 WRITE FILE[0,2],F2$
5370 WRITE FILE[0,3],F3$
5380 CLOSE FILE[0]
5390 CHAIN F3$









1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE 14
                      SYMBOL TABLE FOR UVV0.Q1

SYMBOL    REFERENCES
------  ------------------------------------------------------------------
 0270   0160
 0320   0250
 0650   0610
 0790   0970
 0880   0630  0790  1230  1280  1450  1510  1600  2520  2580  3690
        3760  5120  5200
 0900   1010
 0980   0900
 1050   0970
 1210   1050
 1240   1090  1130
 1320   0970
 1430   1320  1380
 1460   1390
 1510   1420  1940  2060  2170  2250  2290  2360  2390
 1530   1640
 1610   1530
 1660   1600
 1730   1800
 1770   1730
 1810   1760
 1960   1850
 2070   2020
 2110   2200
 2180   2110
 2210   2150  2160
 2270   1660  1840  2220
 2310   1820
 2370   2330
 2430   0970
 2530   2490
 2560   2430
 2620   0970
 2860   2840
 3130   2830  2990  3300  3370  3390
 3140   3280  3480
 3250   3140  3210
 3300   3190  3200
 3390   3240
 3410   3510
 3490   3410
 3520   3460  3470
 3670   2620  3130
 3710   2650
 3800   0970  4120  4580  5160
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE 15
                        SYMBOL TABLE FOR UVV0.Q1

SYMBOL    REFERENCES
------  ----------------------------------------------------------------

 3820   3940
 3910   3820
 3960   3900
 4100   3960
 4140   3900
 4170   4240
 4220   4170
 4260   4150  4350
 4320   4260
 4370   4210  4310
 4590   4520
 4700   4720
 5090   4970
 5140   4140
 5180   3800  3900
 5240   0440  0460  0730  0880  0970
 5330   1200  2550  3650
 A$     0210  1560  1580  1590  1740  1760  2130  2150  2160  2170
        3170  3190  3200  3220  3440  3460  3470  3480  3870  3890
        3900  4150  4440
 A0$    0210  0940  0960  0970
 A2     2320  2340
 C$     0210  0230  0970
 C2     2310  2340
 C5     0380
 C6     0380
 C7     0380  1830
 D7     1330  1830
 D8     1340  1830
 F0     0340  0700
 F0$    0200  0290  0320  0330  0470  0480  0550  0560  0580  0660
        0670  1060  1080  1360  1370  2210  2440  2450  2640  2660
        2740  2750  2780  2800  2850  2870  2930  2960  3520  3530
        3970  3980  3990  4000  4370  4380  4390  4400  4600  4610
        5260  5270  5330  5340
 F1     0340  0680  0700
 F1$    0200  0290  0350  0410  5350
 F2$    0200  0290  0360  0410  0420  5360
 F3$    0200  0290  0370  0420  0430  1190  2540  3640  5310  5370
        5390
 F5     0170  0300  0440
 FL#0   0330  0340  0350  0360  0370  0380  0390  0670  0700  0710
        0720  5340  5350  5360  5370  5380
 FL#1   0480  0490  0500
 FL#2   1080  1100  1110  1160  1170  1370  1400  1410  1440  1490
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE 16
                        SYMBOL TABLE FOR UVV0.Q1

SYMBOL    REFERENCES
------  ----------------------------------------------------------------

        2210  2230  2240  2660  2670  2680  2690  2700  2710
 FL#3   2750  2760  3340  3400  3540  3980  4070  4380  4490  4590
 FL#4   2450  2470  2480  2800  2810  2820  2870  2900  2910  3530
        3550  3610  4000  4010  4060  4400  4420  4480  4710  4760
        4830  5270  5280  5290  5300
 FL#5   2960  2970  3020  3070  3110  4610  4650  4730  4820  4910
        5000  5090  5100  5110
 H      4920  4930  4940  5010  5020  5030  5060  5070  5080
 H0     4650  4670  4770  4790  4810  4820  4900  4970  4990  5070
 H1     4650  4670  4790  4800  4820  4860  4980
 I      0540  0550  0560  0580  0620  1100  1110  1400  2670  2690
        2700  2760  2940  2970  2980  2990  3030  3040  3100  3220
        3240  3330  3340  3350  3360  3400  3540  3570  4050  4080
        4090  4460  4500  4510  4520  4530  4690  4750  4900  4930
        4960  4990  5050
 J      1100  2690  2700  2760  2950  2970  2980  2990  3040  3070
        4440  4500  4510  4660  4700  4710  4770  4780  4790  4810
        4860  4910  4950  4980  5000  5040
 J1     4470  4480  4660  4760
 K      3060  3070  3090  4430  4500  4510  4520  4560  4570  4670
        4680  4730  4740  4870  4910  5000
 L      2760  3030  3160  3240  3330  4290  4310  4510  4620  4630
        4920  5010  5060
 M      0570  3000  3560  3610  4060  4480  4520
 M0     0240  3580  4520  4720  4760  5290
 M1     4420  4820  5280  5290
 M2     4420  4820  5280  5290
 M3     4420  4820  5280  5290
 MI     0220  0590  0610  3010  3020  3050  3070  3080  4710  4720
        4730  4910  4930  5000  5020
 N0     3570  3580  3610  4060  4070  4480  4490  4630  4640  4760
 N0$    0210  3340  3350  3400  3430  3540  4070  4080  4490  4500
 N7     1810  1830
 P      0690  0710  1590  1600  1680  1810  1850
 P0     3590  3610  4060  4080  4480  4690  4760  4770  4790
 P1     3600  3610  4020  4060  4450  4470  4480  4760
 P2     4640  4650  4730  4820  4870  5090  5100
 Q1     0490  1870  1880  1960  1970  1980
 Q2     0490  1870  1880  1960  1970  1980
 Q3     0490  1870  1880  1960  1970  1980
 R      1070  1110  1130  1350  1400  1480  1910  1930  2070  2080
        2100  2230  2670
 R0     1890  1920  1930
 S      4890
 S$     0210  4190  4210  4500
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                           PAGE 17
                            SYMBOL TABLE FOR UVV0.01

SYMBOL    REFERENCES
------   ------------------------------------------------------------------
 S0      2460  2470  2490  2790  2810  2830  2880  2900  3550  4010
         4050  4280  4310  4410  4420  4460  5280
 S1      2890  2900  3550  3600  3610  4010  4420  5280  5290
 S[      0220  0520  0530  0580  5020  5070  5100
 T[      3540  3580
 U       4880
 U[      0220  4930  5020  5090
 V$      0210  1670  1680  1700
 VO[     0220  1830  1870  1880  1960  1970  1980
 W       1870  1890  1960  1990  2010  2050  2070
 W0      1150  1160  2680  2690  2700
 W1      1140  1160  2680  2690  2700
 X       1970  1990  2000  2010  2020
 Y       1880  1890  1980  2000  2010  2050  2070
```

SQA FILTER ANALYSIS MODULE -- UVVO.Q2

UVVO.Q2 is chained to from UVVO.Q1 or UVVO.Q3. Necessary parameters are retrieved from the following data files: UVVOO.TR; UVVOO.CF; UVVOQ.CF; UVVOQ.DS; and UVVOQ.VF. The filter analysis command is received, and a branch made to the appropriate section of code.

The scan command is processed, provided fewer than ten replicates have already been analyzed. A scan of the filter is made. Consult the material on the Data Acquisition/Reduction subroutine for more details. The data are converted to percent transmittance values, and the curve is smoothed. Standards data are retrieved and filter results calculated. Linearity filter results are percent transmittance values, while tristimulus filter results are tristimulus values, which are computed from constants in the 30-Selected-Ordinate method file UVVOO.SF. Based on NBS certified values and historical standards, the program determines precision and accuracy statistics and evaluations. The results are displayed and accepted or rejected. Accepted results are stored in the data summary file, along with the updated replicate counter and replicate pointer.

In the replicate deletion section, the number of replicates must be greater than zero to avoid an error message and a mandatory return to the filter analysis command line. The replicate number is received, and the data summary file is searched for that replicate. Once found, the marker for that replicate is set to -9999, and the replicate counter of the filter header record is decremented by one. These parameters are written to the data summary file.

The SQA intermediate report command is processed only when one or more undeleted replicates have been analyzed. Means and standard deviations are computed for the replicates and stored in the data summary file. The module then chains to the "destination" program UVVO.Q3 via the program exit point.

At the ending section, if the number of replicates exceeds zero, then two major operations take place. The first is the computation of replicate means and standard deviations. The second is the incrementing of the filter counter and the modification of the filter pointer, which is defined as the next available filter header record. These statistics and parameters are stored in the data summary file. After the operations, the "destination" program is defined as UVVO.Q1 and program control drops to the program exit point.

At the program exit point, the modified program location parameters are written to the system status transfer file, and the module chains to the "destination" program.

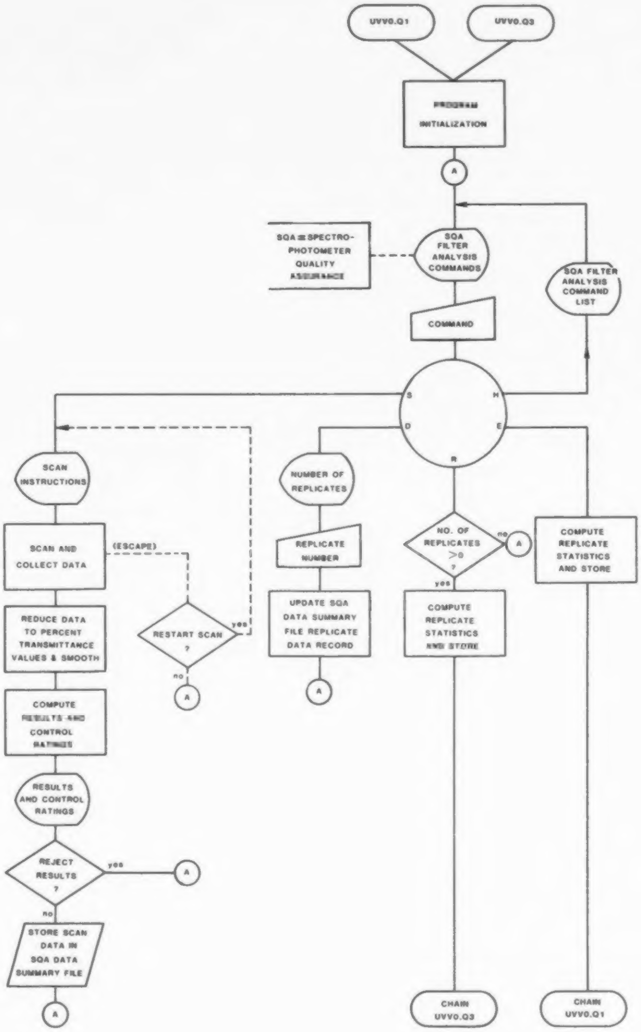

UVV0.Q1
UVV0.Q3
PROGRAM INITIALIZATION
A
SQA ≡ SPECTRO-PHOTOMETER QUALITY ASSURANCE
SQA FILTER ANALYSIS COMMANDS
SQA FILTER ANALYSIS COMMAND LIST
COMMAND
S
H
D
E
R
SCAN INSTRUCTIONS
SCAN AND COLLECT DATA
(ESCAPE)
RESTART SCAN ?
yes
no
REDUCE DATA TO PERCENT TRANSMITTANCE VALUES & SMOOTH
COMPUTE RESULTS AND CONTROL RATINGS
RESULTS AND CONTROL RATINGS
REJECT RESULTS ?
STORE SCAN DATA IN SQA DATA SUMMARY FILE
NUMBER OF REPLICATES
REPLICATE NUMBER
UPDATE SQA DATA SUMMARY FILE REPLICATE DATA RECORD
NO. OF REPLICATES >0 ?
COMPUTE REPLICATE STATISTICS AND STORE
CHAIN UVV0.Q3
CHAIN UVV0.Q1

Figure 6. Flowchart of module UVV0.Q2.

TABLE 10. VARIABLE DESCRIPTIONS FOR MODULE UVVO.Q2

A$	a single-character user-response variable
A2	an accumulator used by CALL 257
A6	the averaged A/D count from CALL 6
C$	the SQA filter analysis command line
C0	the number of signal values taken from the end of one scan array and placed at the beginning of the next
C2	the CALL 257 indicator mumber for scan-clear (for stop)
C5	the transmittance signal channel number
C6	the wavelength signal channel number
C7	the CALL 7 channel-indicator number
D7	the CALL 7 initial time delay (in sixtieth seconds)
D8	the CALL 7 between-signal pairs time delay (in sixtieth seconds)
E1()	the differences between replicate values and corresponding NBS certified values
E2()	the differences between replicate values and corresponding historical standards means
E3	the absolute value of one E1 item
E4	the absolute value of one E2 item
F0$	a file name variable
F1$, F2$, F3$	program location variables; see Table 1
F5	a flag used during program initialization; also used by the statistics-computation subroutine, where: Before subrt.: F5 = 0 After subroutine: F5 = 0 for completed subroutine function F5 = 1 for escape during subroutine
F6	a flag used by the Data Acquisition/Reduction (DAR) subroutine; initially set to zero, the values returned are: F6 = 1 for completed subroutine function F6 = 2 for escape during scan; restart scan F6 = 3 for escape during scan; do not restart scan
H0	the number of sets of scan data for a particular filter in the historical standards file; H0 never exceeds 25
H1	the pointer to the first set of scan data of a particular filter in the historical standards file
I, J, K, L	loop-counter and general-purpose variables
I0	the number of signal pairs (less one) acquired in a DAR scan
J1, J2	scan array pointers used in the DAR subroutine
K0	the highest wavelength of the spectrophotometer or the V0 scan array prior to scanning

TABLE 10. (continued)

K1	the limit above which K0 must be before a scan may begin
L$	an output and output-format character string
M	the marker (first item) of each filter header record in the data summary file, where: M = 0 for data not added to historical standards file M = -9999 for data already added to historical stnds. file
M0	an indicator constant of value -9999; various applications
M()	the results for a particular filter replicate, where: • for linearity filters are the percent transmittance values at the appropriate wavelengths W() • for tristimulus filters, M(1) is tristimulus value X, M(2) is tristimulus value Y, M(3) is tristimulus value Z
N0	the filter number (corresponding to its designation)
N0$	the filter designation
N1	the total number of values to fill the V0 scan array
N6	the number of A/D counts to be acquired and averaged in a CALL 6
N7	the actual number of counts to be put in the V0 scan array
P0	the replicate counter (number of scans of a filter)
P1	the replicate pointer (to next available record in UVVOQ.DS)
P2	the pointer to a filter header record in file UVVOQ.SF
Q1, Q2, Q3	the constants of the wavelength calibration equation
R	the scan speed (in nanometers per minute)
R0$	a character string constant used for control ratings
R1$	an output character string for accuracy ratings
R2$	an output character string for precision ratings
R3	an accuracy control rating indicator for a replicate value
R4	a precision control rating indicator for a replicate value
S0	the filter counter (number of filters analyzed)
S1	the filter pointer (to next header record in UVVOQ.DS)
S3, S4	two and three times the standard deviation of some historical standards mean
S()	the standard deviations of the U means
T()	the NBS certified values for a particular filter
U()	the means of the historical standards values
V$	a general purpose character string
V0()	the CALL 7 scan (data storage) array
W, X, Y	general-purpose variables usually representing wavelength
W0, W1	the lower and upper scan range wavelength bounds
W()	the five wavelengths at which the linearity filter percent transmittance values are taken
X0, X1	the lower and upper wavelength bounds evaluated after a scan portion
Z()	the array in which evaluated A/D counts at nanometer increments are stored and subsequently reduced to percent transmittance values and smoothed

```
A-U-T-´-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE  1
                        PROGRAM LISTING FOR UVV0.Q2

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0010 REM         ++++++++++++++++++++++++++++++++++++++++
0020 REM         +    AUTOMATED  ULTRAVIOLET-VISIBLE     +
0030 REM         +       SPECTROPHOTOMETER SYSTEM        +
0040 REM         +    SPECTRO. QUALITY ASSURANCE (SQA)   +
0050 REM         +    FILTER ANALYSIS MODULE: UVV0.Q2    +
0060 REM         +    WRITTEN BY GREG ROTH (5/16/80)     +
0070 REM         +    UNIV. OF CINCI. COMPUTER CENTER    +
0080 REM         +    (UVV0.Q2 IS A SUB-MODULE OF THE    +
0090 REM         +    SQA  ANALYSIS  MODULE  UVV0.Q1)    +
0100 REM         ++++++++++++++++++++++++++++++++++++++++
0110 REM
0120 REM
0130 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0140 REM                    PROGRAM INITIALIZATION
0150 REM
0160 REM ----------  SET PAGE/ESC/ROUTE-FLAG/#-OF-REP´S
0170 PAGE =72
0180 ON ESC THEN GOTO 0420
0190 LET F5=0
0200 LET P0=0
0210 ESC
0220 REM ----------  DIM/INIT STRING VARS. AND ARRAYS
0230 DIM F0$[13],F1$[13],F2$[13],F3$[13],L$[72],A$[1]
0240 DIM C$[5],N0$[5],V$[25],R1$[15],R2$[15],R0$[3]
0250 DIM M[5],U[5],S[5],T[5],W[5],E1[5],E2[5]
0260 LET I0=81
0270 DIM V0[(I0+1)*2]
0280 LET D7=0
0290 LET D8=0
0300 LET A6=0
0310 LET N6=5
0320 LET W[1]=440
0330 LET W[2]=465
0340 LET W[3]=546.1
0350 LET W[4]=590
0360 LET W[5]=635
0370 LET C$="SDREH"
0380 LET R0$="***"
0390 LET M0=-9999
0400 GOTO 0470
0410 REM ----------  ESCAPE DURING INITIALIZATION
0420 NOESC

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-´-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE  2
                        PROGRAM LISTING FOR UVV0.Q2

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0430 CLOSE
0440 DIM F0$[13],F1$[13],F2$[13],F3$[13]
0450 LET F5=1
0460 REM ----------  RETRIEVE SYSTEM STATUS PARMS.
0470 LET F0$="UVV00.TR"
0480 OPEN FILE[0,0],F0$,21
0490 READ FILE[0,1],F1$
0500 READ FILE[0,2],F2$
0510 READ FILE[0,3],F3$
0520 READ FILE[0,6],C5,C6,C7
0530 CLOSE FILE[0]
0540 REM   [MODIFY PROGRAM LOCATION VARS.]
0550 LET F1$=F2$
0560 LET F2$=F3$
0570 LET F3$=""
0580 IF F5=1 THEN GOTO 4550
0590 REM ----------  RETRIEVE WAVELENGTH CALIBRATION DATA
0600 ON ESC THEN GOTO 4550
0610 LET F0$="UVV00.CF"
0620 OPEN FILE[1,0],F0$,20
0630 READ FILE[1,1],Q1,Q2,Q3
0640 CLOSE FILE[1]
0650 REM ---------- RETRIEVE TRANSMITTANCE CALIBRATION DATA
0660 LET F0$="UVV0Q.CF"
0670 OPEN FILE[2,0],F0$,8
0680 READ FILE[2,1],I,R
0690 READ FILE[2,2],W1,W0
0700 CLOSE FILE[2]
0710 REM   [DIM/INIT REMAINING SCAN VARS.]
0720 LET D8=3600/R
0730 DIM Z[W1-W0+1]
0740 REM ----------  RETRIEVE BASIC DATA SUMMARY INFO.
0750 LET F0$="UVV0Q.DS"
0760 OPEN FILE[4,0],F0$,20
0770 READ FILE[4,0],S0,S1
0780 READ FILE[4,S1],M,N0,P0,P1
0790 CLOSE FILE[4]
0800 REM ----------  RETRIEVE NBS STANDARDS DATA
0810 LET F0$="UVV0Q.VF"
0820 OPEN FILE[3,0],F0$,28
0830 READ FILE[3,ABS(N0)],N0$,T[1],T[2],T[3],T[4],T[5]
0840 CLOSE FILE[3]

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                        PAGE  3
                     PROGRAM LISTING FOR UVV0.02

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0850 GOTO 0980
0860 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0870 REM           SPECTROPHOTOMETER QUALITY ASSURANCE (SQA)
0880 REM                FILTER ANALYSIS COMMAND LEVEL
0890 REM
0900 REM ----------  SQA FILTER ANALYSIS COMMAND LIST
0910 ON ESC THEN GOTO 0980
0920 PRINT
0930 PRINT "S  ---  SCAN OF ONE REPLICATE"
0940 PRINT "D  ---  DELETION OF ONE REPLICATE"
0950 PRINT "R  ---  INTERMEDIATE QUALITY ASSURANCE REPORT"
0960 PRINT "E  ---  END OF ANALYSIS OF THIS FILTER"
0970 REM ----------  SQA FILTER ANALYSIS COMMAND SELECT
0980 ON ESC THEN GOTO 4550
0990 ESC
1000 ON ERR THEN GOTO 1080
1010 PRINT
1020 PRINT
1030 PRINT "FILTER ANALYSIS COMMANDS:  S, D, R, E, H(CR)";
1040 INPUT "  >>> ",A$
1050 ON ERR THEN STOP
1060 IF LEN(A$)=0 THEN LET A$="H"
1070 ON POS(C$,A$,1) THEN GOTO 1150, 3960, 4350, 4550, 0910
1080 ON ERR THEN STOP
1090 PRINT "<7>"
1100 PRINT "INVALID COMMAND."
1110 GOTO 1000
1120 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
1130 REM                       FILTER SCAN SECTION
1140 REM
1150 ON ESC THEN GOTO 2750
1160 IF P0<10 THEN GOTO 1210
1170 PRINT "<7>"
1180 PRINT "MAY NOT EXCEED LIMIT OF TEN REPLICATES."
1190 GOTO 0980
1200 REM ----------  SCAN REPLICATE
1210 ON ERR THEN GOTO 1270
1220 PRINT
1230 PRINT "SET AT";(W1+5);"NM., SET FOR SCAN AND";
1240 INPUT " PRESS CR KEY.  ",A$
1250 ON ERR THEN STOP
1260 IF LEN(A$)=0 THEN GOTO 1300

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         (         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                        PAGE  4
                     PROGRAM LISTING FOR UVV0.02

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
1270 ON ERR THEN STOP
1280 PRINT "<7>"
1290 GOTO 1210
1300 LET F6=0
1310 GOSUB 2790
1320 ON ESC THEN GOTO 0980
1330 ESC
1340 ON F6 THEN GOTO 1390, 1210, 2750
1350 PRINT "<7>"
1360 PRINT "ABNORMAL SCAN INTERRUPT."
1370 GOTO 0980
1380 REM ----------  REDUCE/SMOOTH DATA
1390 LET F0$="UVV0Q.CF"
1400 OPEN FILE[2,0],F0$,8
1410 FOR I=W1 TO W0 STEP -1
1420   READ FILE[2,(W1-I+3)],X,Y
1430   LET Z[W1-I+1]=((Z[W1-I+1]-X)/(Y-X))*100
1440 NEXT I
1450 CLOSE FILE[2]
1460 LET X=Z[1]
1470 LET W=Z[2]
1480 FOR I=3 TO (W1-W0-1)
1490   LET Y=X
1500   LET X=W
1510   LET W=-3*(Z[I-2]+Z[I+2])
1520   LET W=W+12*(Z[I-1]+Z[I+1])
1530   LET W=W+17*Z[I]
1540   LET W=W/35
1550   LET Z[I-2]=Y
1560 NEXT I
1570 LET Z[W1-W0-2]=X
1580 LET Z[W1-W0-1]=W
1590 REM ----------  RETRIEVE STANDARDS DATA & COMPUTE RESULTS
1600 LET F0$="UVV0Q.SF"
1610 OPEN FILE[5,0],F0$,20
1620 LET P2=1+28*(ABS(N0)-1)
1630 READ FILE[5,P2],H0,H1
1640 READ FILE[5,(P2+1)],U[1],U[2],U[3],U[4],U[5]
1650 READ FILE[5,(P2+2)],S[1],S[2],S[3],S[4],S[5]
1660 CLOSE FILE[5]
1670 IF N0<0 THEN GOTO 1760
1680 REM   [FOR LINEARITY FILTER RESULTS...]

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVV0.02

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
1690 FOR I=1 TO 5
1700   LET J=INT(W[I])
1710   LET K=-INT(-W[I])
1720   LET M[I]=Z[W1-J+1]+(Z[W1-K+1]-Z[W1-J+1])*(W[I]-J)
1730 NEXT I
1740 GOTO 1900
1750 REM   [FOR TRISTIMULUS FILTER RESULTS...]
1760 LET F0$="UVV00.SF"
1770 OPEN FILE[6,0],F0$,8
1780 MAT M=ZER
1790 FOR I=1 TO 90
1800   READ FILE[6,I],W,J
1810   LET K=INT(W)
1820   LET L=-INT(-W)
1830   LET M[J]=M[J]+(Z[W1-K+1]+(Z[W1-L+1]-Z[W1-K+1])*(W-K))
1840 NEXT I
1850 CLOSE FILE[6]
1860 LET M[1]=M[1]*3.269E-02
1870 LET M[2]=M[2]*3.333E-02
1880 LET M[3]=M[3]*3.938E-02
1890 REM   [COMPUTE STATISTICS]
1900 LET R1$="               "
1910 LET R2$=R1$
1920 LET L=3
1930 IF N0>0 THEN LET L=5
1940 FOR I=1 TO L
1950   LET E1[I]=M[I]-T[I]
1960   LET E2[I]=M[I]-U[I]
1970   LET E3=ABS(E1[I])
1980   LET E4=ABS(E2[I])
1990   LET S3=S[I]+S[I]
2000   LET S4=S3+S[I]
2010   IF E3<S3 THEN LET R3=0
2020   IF E3>=S3 THEN IF E3<=S4 THEN LET R3=1
2030   IF E3>S4 THEN LET R3=2
2040   IF E4<S3 THEN LET R4=0
2050   IF E4>=S3 THEN IF E4<=S4 THEN LET R4=1
2060   IF E4>S4 THEN LET R4=2
2070   LET J=1+(I-1)*3
2080   LET R1$[J,(J+R3)]=R0$[1,(R3+1)]
2090   LET R2$[J,(J+R4)]=R0$[1,(R4+1)]
2100 NEXT I

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVV0.02

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2110 REM ----------  DISPLAY RESULTS
2120 LET L$="NBS FILTER #####:"
2130 IF N0>0 THEN LET L$=L$,"  (VALUES IN PERCENT TRANSMITTANCE)"
2140 PRINT
2150 PRINT USING L$,N0$
2160 PRINT
2170 LET L$="        SPECTRO.     NBS     HISTORIC     "
2180 PRINT L$;"ACCURACY:        PRECISION:"
2190 LET L$=" WAVE-   MEASURED   CERTIFIED   CONTROL    "
2200 IF N0<0 THEN LET L$[1,6]="TRIST."
2210 PRINT L$;"DIFF.  CNTRL.   DIFF.  CNTRL."
2220 LET L$="LENGTH     [A]         [B]      MEAN [C]   "
2230 IF N0<0 THEN LET L$[1,6]="VALUE "
2240 PRINT L$;"[A-B]  RATING   [A-C]  RATING"
2250 LET L$=" #####      --#.##      --#.##     --#.##   "
2260 LET L$=L$,"  -#.##    ###     -#.##   ###"
2270 LET V$="  X    Y    Z   "
2280 IF N0<0 THEN GOTO 2330
2290 FOR I=1 TO 5
2300   LET V$[1+(I-1)*5]=STR$(W[I])
2310   IF LEN(V$)<(I*5) THEN LET V$[(I*5-1),(I*5)]=".0"
2320 NEXT I
2330 FOR I=1 TO L
2340   LET J=1+(I-1)*5
2350   LET K=1+(I-1)*3
2360   PRINT USING L$,V$[J,(J+4)],M[I],T[I],U[I],E1[I],R1$[K,K+2],E2[I
*      ],R2$[K,K+2]
2370 NEXT I
2380 LET L$="CONTROL RATING:  * -- IN CONTROL; ** -- WARNING;"
2390 PRINT
2400 PRINT L$;" *** -- OUT OF CONTROL."
2410 LET L$="BASED ON STAND DEV (SD) OF CONTROL MEAN "
2420 IF N0<0 THEN GOTO 2490
2430 LET L$=L$,"AT ###.# NM (SD #.##), ###.# NM"
2440 PRINT USING L$,W[1],S[1],W[2]
2450 LET L$="(SD #.##), ###.# NM "
2460 LET L$=L$[1,20],L$[1,20],L$[1,20],L$[1,9]
2470 PRINT USING L$,S[2],W[3],S[3],W[4],S[4],W[5],S[5]
2480 GOTO 2520
2490 LET L$=L$,"FOR X (#.##), Y (#.##), Z(#.##)"
2500 PRINT USING L$,S[1],S[2],S[3]
2510 REM ----------  OPTIONAL RESULTS REJECTION

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVV0.Q2

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2520 ON ERR THEN GOTO 2590
2530 PRINT
2540 INPUT "REJECT RESULTS ?  [N(CR) OR Y]  >>> ",A$
2550 ON ERR THEN STOP
2560 IF LEN(A$)=0 THEN GOTO 2620
2570 IF A$="N" THEN GOTO 2620
2580 IF A$="Y" THEN GOTO 0980
2590 ON ERR THEN STOP
2600 PRINT "<7>"
2610 GOTO 2520
2620 LET F0$="UVV0Q.DS"
2630 OPEN FILE[4,0],F0$,20
2640 READ FILE[4,0],S0,S1
2650 READ FILE[4,S1],M,N0,P0,P1
2660 WRITE FILE[4,P1],M[1],M[2],M[3],M[4],M[5]
2670 LET P0=P0+1
2680 LET P1=P1+1
2690 WRITE FILE[4,S1],M,N0,P0,P1
2700 CLOSE FILE[4]
2710 PRINT
2720 PRINT "RESULTS OF REPLICATE";P0;"ARE STORED."
2730 GOTO 0980
2740 REM ----------  ESCAPE DURING FILTER SCAN
2750 NOESC
2760 CLOSE
2770 GOTO 0980
2780 REM ----------  DATA ACQUISITION/REDUCTION SUBROUTINE
2790 ON ESC THEN GOTO 3630
2800 LET F6=1
2810 LET X1=W1
2820 LET K1=X1
2830 LET C0=0
2840 REM   [MAKE SURE WAVELENGTH HIGH ENOUGH]
2850 ON ESC THEN GOTO 3630
2860 CALL 6,C6,N6,A6
2870 LET K0=Q1+A6*(Q2+Q3*A6)
2880 IF K0>K1 THEN GOTO 2990
2890 PRINT
2900 PRINT "SET WAVELENGTH UP";(K1-INT(K0)+1);"NM."
2910 ON ERR THEN GOTO 2950
2920 INPUT "PRESS CR KEY TO CONTINUE SCAN. ",A$
2930 ON ERR THEN STOP

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVV0.Q2

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2940 IF LEN(A$)=0 THEN GOTO 2850
2950 ON ERR THEN STOP
2960 PRINT "<7>"
2970 GOTO 2910
2980 REM   [MAKE SURE SCAN-TO WL. NOT BELOW (LOW WL.BOUND - 5)]
2990 LET K0=INT(K0)
3000 LET X0=K0-I0
3010 IF X0<(W0-5) THEN LET X0=(W0-5)
3020 PRINT "     SCANNING FROM";K0;"TO";X0;"NM.    ";
3030 REM   [SET #-OF-POINTS PARM. & SCAN]
3040 LET N1=(K0-X0+1)*2
3050 LET N7=N1-C0
3060 ON ESC THEN GOTO 3550
3070 ON ERR THEN GOTO 3870
3080 CALL 7,C7,D7,D8,N7,V0[1+C0]
3090 ON ESC THEN GOTO 3630
3100 ON ERR THEN STOP
3110 REM   [CHECK RANGE: HIGH ENOUGH START; OVER HALF SCANNED]
3120 LET W=Q1+V0[2]*(Q2+Q3*V0[2])
3130 LET Y=Q1+V0[N1]*(Q2+Q3*V0[N1])
3140 IF W<X1 THEN GOTO 3160
3150 IF (W-Y)>(N1/4) THEN GOTO 3280
3160 PRINT "<7>"
3170 PRINT "PROBLEM IN SCAN RANGE;"
3180 PRINT "SET WAVELENGTH AT";X1+1;"NM.;"
3190 ON ERR THEN GOTO 3230
3200 INPUT "PRESS CR KEY TO CONTINUE SCAN. ",A$
3210 ON ERR THEN STOP
3220 IF LEN(A$)=0 THEN GOTO 2850
3230 ON ERR THEN STOP
3240 PRINT "<7>"
3250 GOTO 3190
3260 GOTO 2860
3270 REM   [DETERMINE LOWEST WAVELEN IN CALL 7 ARRAY]
3280 LET X0=-INT(-(Q1+V0[N1]*(Q2+Q3*V0[N1])))
3290 IF X0<W0 THEN LET X0=W0
3300 REM   [EVALUATE PERCENT TRANSMITTANCE VALUES]
3310 PRINT "EVALUATING AT";X1;"THRU";X0;"NM."
3320 LET J2=0
3330 ON ERR THEN STOP
3340 FOR I=X1 TO X0 STEP -1
3350   LET J2=J2+2

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
3360   IF J2>N1 THEN GOTO 3460
3370   LET W=Q1+V0[J2]*(Q2+Q3*V0[J2])
3380   IF W>=I THEN GOTO 3350
3390   LET J1=J2-2
3400   LET L=I
3410   LET Y=Q1+V0[J1]*(Q2+Q3*V0[J1])
3420   LET X=(I-Y)/(W-Y)
3430   LET Z[W1-L+1]=V0[J1-1]-X*(V0[J2-1]-V0[J1-1])
3440   LET J2=J1-2
3450 NEXT I
3460 LET X1=L-1
3470 IF X1<W0 THEN RETURN
3480 LET C0=((N1-J1)+2)
3490 FOR I=1 TO C0
3500   LET V0[I]=V0[(J1-2)+I]
3510 NEXT I
3520 LET K1=X1-1
3530 GOTO 2850
3540 REM   [ESCAPE DURING SCAN; ISSUE SCAN-CLEAR; ROUTE]
3550 LET N1=N7+C0
3560 LET C2=24823
3570 LET A2=0
3580 ON ERR THEN GOTO 3810
3590 CALL 257,C2,A2
3600 ON ERR THEN STOP
3610 PRINT "<7>";
3620 PRINT "SCAN INTERRUPT."
3630 NOESC
3640 ON ESC THEN RETURN
3650 LET F6=2
3660 ESC
3670 ON ERR THEN GOTO 3740
3680 PRINT
3690 INPUT "RESTART SCAN ?  [N(CR) OR Y]  >>> ",A$
3700 ON ERR THEN STOP
3710 IF LEN(A$)=0 THEN LET A$="N"
3720 IF A$="N" THEN GOTO 3770
3730 IF A$="Y" THEN GOTO 3770
3740 ON ERR THEN STOP
3750 PRINT "<7>"
3760 GOTO 3670
3770 NOESC

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
3780 LET F6=2
3790 IF A$="N" THEN LET F6=3
3800 RETURN
3810 NOESC
3820 ON ERR THEN STOP
3830 PRINT "<7>"
3840 PRINT "UNEXPECTED ERROR IN CALL 257 SCAN-CLEAR."
3850 LET F6=2
3860 RETURN
3870 NOESC
3880 ON ERR THEN STOP
3890 PRINT "<7>"
3900 PRINT "UNEXPECTED ERROR IN CALL 7."
3910 LET F6=2
3920 RETURN
3930 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
3940 REM                  REPLICATE DELETION SECTION
3950 REM
3960 ON ESC THEN GOTO 4290
3970 IF P0>0 THEN GOTO 4010
3980 PRINT "<7>"
3990 PRINT "NO REPLICATES ANALYZED."
4000 GOTO 0980
4010 ON ERR THEN GOTO 4070
4020 PRINT
4030 PRINT "FILTER ";N0$;" REPLICATE TO BE DELETED [1 TO ";STR$(P0);"]
*     ";
4040 INPUT "  >>> ",K
4050 ON ERR THEN STOP
4060 IF K>=1 THEN IF K<=P0 THEN IF K=INT(K) THEN GOTO 4110
4070 ON ERR THEN STOP
4080 PRINT "<7>"
4090 PRINT "PLEASE ENTER SINGLE NUMBER."
4100 GOTO 4010
4110 LET F0$="UVV0Q.DS"
4120 OPEN FILE[4,0],F0$,20
4130 READ FILE[4,0],S0,S1
4140 READ FILE[4,S1],M,N0,P0,P1
4150 LET J=S1+2
4160 FOR I=1 TO K
4170   LET J=J+1
4180   READ FILE[4,J],M[1],M[2],M[3],M[4],M[5]

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE 11
                      PROGRAM LISTING FOR UVV0.Q2

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
4190   IF M[1]=M0 THEN GOTO 4170
4200 NEXT I
4210 WRITE FILE[4,J],M0,M[2],M[3],M[4],M[5]
4220 LET P0=P0-1
4230 WRITE FILE[4,S1],M,N0,P0,P1
4240 CLOSE FILE[4]
4250 PRINT
4260 PRINT "REPLICATE";K;"DELETED."
4270 GOTO 0980
4280 REM ----------  ESCAPE DURING REPL. DELETION
4290 NOESC
4300 CLOSE
4310 GOTO 0980
4320 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
4330 REM               SQA INTERMEDIATE REPORT SECTION
4340 REM
4350 ON ESC THEN GOTO 4490
4360 IF P0>0 THEN GOTO 4400
4370 PRINT "<7>"
4380 PRINT "NO REPLICATES ANALYZED."
4390 GOTO 0980
4400 LET F5=0
4410 GOSUB 4880
4420 ON ESC THEN GOTO 4490
4430 ESC
4440 IF F5=1 THEN GOTO 4490
4450 NOESC
4460 LET F3$="UVV0.Q3"
4470 GOTO 4760
4480 REM ----------  ESCAPE BEFORE REPORT PREPARATION
4490 NOESC
4500 CLOSE
4510 GOTO 0980
4520 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
4530 REM              SQA FILTER ANALYSIS ENDING SECTION
4540 REM
4550 ON ESC THEN GOTO 4720
4560 IF P0=0 THEN GOTO 4680
4570 LET F5=0
4580 GOSUB 4880
4590 ON ESC THEN GOTO 4720
4600 ESC

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE 12
                      PROGRAM LISTING FOR UVV0.Q2

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
4610 IF F5=1 THEN GOTO 4720
4620 LET F0$="UVV0Q.DS"
4630 OPEN FILE[4,0],F0$,20
4640 READ FILE[4,0],S0,S1,I,J,K
4650 READ FILE[4,S1],M,N0,P0,P1
4660 WRITE FILE[4,0],(S0+1),P1,I,J,K
4670 CLOSE FILE[4]
4680 NOESC
4690 LET F3$="UVV0.Q1"
4700 GOTO 4760
4710 REM ----------  ESCAPE BEFORE EXIT
4720 NOESC
4730 CLOSE
4740 GOTO 0980
4750 REM ----------  EXIT POINT
4760 NOESC
4770 CLOSE
4780 LET F0$="UVV00.TR"
4790 OPEN FILE[0,0],F0$,21
4800 WRITE FILE[0,1],F1$
4810 WRITE FILE[0,2],F2$
4820 WRITE FILE[0,3],F3$
4830 CLOSE FILE[0]
4840 CHAIN F3$
4850 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
4860 REM              STATISTICS-COMPUTATION SUBROUTINE
4870 REM
4880 ON ESC THEN GOTO 5260
4890 LET F0$="UVV0Q.DS"
4900 OPEN FILE[4,0],F0$,20
4910 READ FILE[4,0],S0,S1
4920 READ FILE[4,S1],M,N0,P0,P1
4930 LET L=3
4940 IF N0>0 THEN LET L=5
4950 MAT U=ZER
4960 MAT S=ZER
4970 LET J=S1+2
4980 FOR I=1 TO P0
4990   LET J=J+1
5000   READ FILE[4,J],M[1],M[2],M[3],M[4],M[5]
5010   IF M[1]=M0 THEN GOTO 4990
5020   FOR K=1 TO L

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-´-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                      PAGE 13
                PROGRAM LISTING FOR UVV0.02

12345678911234567892123456789312345678941234567895123456789612345678970
         0         0         0         0         0         0         0
5030      LET U[K]=((I-1)/I*U[K])+(M[K]/I)
5040    NEXT K
5050 NEXT I
5060 REM ---------  TEMPORARY AVOIDANCE OF STND. DEV. COMP.
5070 GOTO 5210
5080 LET J=S1+2
5090 FOR I=1 TO PO
5100   LET J=J+1
5110   READ FILE[4,J],M[1],M[2],M[3],M[4],M[5]
5120   IF M[1]=MO THEN GOTO 5100
5130   FOR K=1 TO L
5140     LET S[K]=S[K]+(M[K]-U[K])^2
5150   NEXT K
5160 NEXT I
5170 FOR I=1 TO L
5180   LET S[I]=SQR(S[I]/(PO-1))
5190 NEXT I
5200 REM ---------  STORE RESULTS
5210 WRITE FILE[4,(S1+1)],U[1],U[2],U[3],U[4],U[5]
5220 WRITE FILE[4,(S1+2)],S[1],S[2],S[3],S[4],S[5]
5230 CLOSE FILE[4]
5240 RETURN
5250 REM ---------  ESCAPE DURING SUBROUTINE
5260 NOESC
5270 CLOSE
5280 LET F5=1
5290 RETURN

12345678911234567892123456789312345678941234567895123456789612345678970
         0         0         0         0         0         0         0
```

```
A-U-T-´-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                      PAGE 14
                        SYMBOL TABLE FOR UVV0.02

SYMBOL   REFERENCES
------  --------------------------------------------------------------
 0420   0180
 0470   0400
 0910   1070
 0980   0850  0910  1190  1320  1370  2580  2730  2770  4000  4270
        4310  4390  4510  4740
 1000   1110
 1080   1000
 1150   1070
 1210   1160  1290  1340
 1270   1210
 1300   1260
 1390   1340
 1760   1670
 1900   1740
 2330   2280
 2490   2420
 2520   2480  2610
 2590   2520
 2620   2560  2570
 2750   1150  1340
 2790   1310
 2850   2940  3220  3530
 2860   3260
 2910   2970
 2950   2910
 2990   2880
 3160   3140
 3190   3250
 3230   3190
 3280   3150
 3350   3380
 3460   3360
 3550   3060
 3630   2790  2850  3090
 3670   3760
 3740   3670
 3770   3720  3730
 3810   3580
 3870   3070
 3960   1070
 4010   3970  4100
 4070   4010
 4110   4060
 4170   4190
 4290   3960
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                    PAGE 15
                       SYMBOL TABLE FOR UVV0.02

SYMBOL   REFERENCES
------   --------------------------------------------------------------
  4350   1070
  4400   4360
  4490   4350  4420  4440
  4550   0580  0600  0980  1070
  4680   4560
  4720   4550  4590  4610
  4760   4470  4700
  4880   4410  4580
  4990   5010
  5100   5120
  5210   5070
  5260   4880
  A$     0230  1040  1060  1070  1240  1260  2540  2560  2570  2580
         2920  2940  3200  3220  3690  3710  3720  3730  3790
  A2     3570  3590
  A6     0300  2860  2870
  C$     0240  0370  1070
  C0     2830  3050  3080  3480  3490  3550
  C2     3560  3590
  C5     0520
  C6     0520  2860
  C7     0520  3080
  D7     0280  3080
  D8     0290  0720  3080
  E1[    0250  1950  1970  2360
  E2[    0250  1960  1980  2360
  E3     1970  2010  2020  2030
  E4     1980  2040  2050  2060
  F0$    0230  0440  0470  0480  0610  0620  0660  0670  0750  0760
         0810  0820  1390  1400  1600  1610  1760  1770  2620  2630
         4110  4120  4620  4630  4780  4790  4890  4900
  F1$    0230  0440  0490  0550  4800
  F2$    0230  0440  0500  0550  0560  4810
  F3$    0230  0440  0510  0560  0570  4460  4690  4820  4840
  F5     0190  0450  0580  4400  4440  4570  4610  5280
  F6     1300  1340  2800  3650  3780  3790  3850  3910
  FL#0   0480  0490  0500  0510  0520  0530  4790  4800  4810  4820
         4830
  FL#1   0620  0630  0640
  FL#2   0670  0680  0690  0700  1400  1420  1450
  FL#3   0820  0830  0840
  FL#4   0760  0770  0780  0790  2630  2640  2650  2660  2690  2700
         4120  4130  4140  4180  4210  4230  4240  4630  4640  4650
         4660  4670  4900  4910  4920  5000  5110  5210  5220  5230
  FL#5   1610  1630  1640  1650  1660
```

```
            U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                    PAGE 16
                       SYMBOL TABLE FOR UVV0.02

SYMBOL   REFERENCES
------   --------------------------------------------------------------
  FL#6   1770  1800  1850
  H0     1630
  H1     1630
  I      0680  1410  1420  1430  1440  1480  1510  1520  1530  1550
         1560  1690  1700  1710  1720  1730  1790  1800  1840  1940
         1950  1960  1970  1980  1990  2000  2070  2100  2290  2300
         2310  2320  2330  2340  2350  2360  2370  3340  3380  3400
         3420  3450  3490  3500  3510  4160  4200  4640  4660  4980
         5030  5050  5090  5160  5170  5180  5190
  I0     0260  0270  3000
  J      1700  1720  1800  1830  2070  2080  2090  2340  2360  4150
         4170  4180  4210  4640  4660  4970  4990  5000  5080  5100
         5110
  J1     3390  3410  3430  3440  3480  3500
  J2     3320  3350  3360  3370  3390  3430  3440
  K      1710  1720  1810  1830  2350  2360  4040  4060  4160  4260
         4640  4660  5020  5030  5040  5130  5140  5150
  K0     2870  2880  2900  2990  3000  3020  3040
  K1     2820  2880  2900  3520
  L      1820  1830  1920  1930  1940  2330  3400  3430  3460  4930
         4940  5020  5130  5170
  L$     0230  2120  2130  2150  2170  2180  2190  2200  2210  2220
         2230  2240  2250  2260  2360  2380  2400  2410  2430  2440
         2450  2460  2470  2490  2500
  M      0780  1780  2650  2690  4140  4230  4650  4920
  M0     0390  4190  4210  5010  5120
  M[     0250  1720  1830  1860  1870  1880  1950  1960  2360  2660
         4180  4190  4210  5000  5010  5030  5110  5120  5140
  N0     0780  0830  1620  1670  1930  2130  2200  2230  2280  2420
         2650  2690  4140  4230  4650  4920  4940
  N0$    0240  0830  2150  4030
  N1     3040  3050  3130  3150  3280  3360  3480  3550
  N6     0310  2860
  N7     3050  3080  3550
  P0     0200  0780  1160  2650  2670  2690  2720  3970  4030  4060
         4140  4220  4230  4360  4560  4650  4920  4980  5090  5180
  P1     0780  2650  2660  2680  2690  4140  4230  4650  4660  4920
  P2     1620  1630  1640  1650
  Q1     0630  2870  3120  3130  3280  3370  3410
  Q2     0630  2870  3120  3130  3280  3370  3410
  Q3     0630  2870  3120  3130  3280  3370  3410
  R      0680  0720
  R0$    0240  0380  2080  2090
  R1$    0240  1900  1910  2080  2360
  R2$    0240  1910  2090  2360
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE 17
                           SYMBOL TABLE FOR UVV0.02

SYMBOL    REFERENCES
------   ----------------------------------------------------------------

 R3      2010  2020  2030  2080
 R4      2040  2050  2060  2090
 S       4960
 S0      0770  2640  4130  4640  4660  4910
 S1      0770  0780  2640  2650  2690  4130  4140  4150  4230  4640
         4650  4910  4920  4970  5080  5210  5220
 S3      1990  2000  2010  2020  2040  2050
 S4      2000  2020  2030  2050  2060
 S[      0250  1650  1990  2000  2440  2470  2500  5140  5180  5220
 T[      0250  0830  1950  2360
 U       4950
 U[      0250  1640  1960  2360  5030  5140  5210
 V$      0240  2270  2300  2310  2360
 VO[     0270  3080  3120  3130  3280  3370  3410  3430  3500
 W       1470  1500  1510  1520  1530  1540  1580  1800  1810  1820
         1830  3120  3140  3150  3370  3380  3420
 W0      0690  0730  1410  1480  1570  1580  3010  3290  3470
 W1      0690  0730  1230  1410  1420  1430  1480  1570  1580  1720
         1830  2810  3430
 W[      0250  0320  0330  0340  0350  0360  1700  1710  1720  2300
         2440  2470
 X       1420  1430  1460  1490  1500  1570  3420  3430
 X0      3000  3010  3020  3040  3280  3290  3310  3340
 X1      2810  2820  3140  3180  3310  3340  3460  3470  3520
 Y       1420  1430  1490  1550  3130  3150  3410  3420
 Z[      0730  1430  1460  1470  1510  1520  1530  1550  1570  1580
         1720  1830  3430
```

SQA ANALYSIS INTERMEDIATE AND SUMMARY REPORT MODULE -- UVVO.Q3

UVVO.Q3 is chained to from UVVO.Q1 or UVVO.Q2. After the module retrieves the system status parameters and initializes certain output strings, it opens all necessary data files and prepares an intermediate or summary report.

For an intermediate report, the title, date and names, filter data, and footnote are prepared. Program control jumps to the report output section.

For a summary report, a loop is processed for every three filters. Within each loop, the page counter is incremented, the title, date and names are prepared, the filter data are formatted, and the footnote is appended. The module flow drops to the report output section.

Output options for a terminal report, a lineprinter report, and run continuance are presented, and one is received. For terminal reports, the list file UVVLPT is read and output to the terminal. Records enclosed by a pair of "&" or "!" symbols are ignored; they apply only to lineprinter output. Also, no more than one line is skipped at any time. For lineprinter output, UVVLPT records are written to the lineprinter file $LPT. All records are output, except for those with the "&" or "!" symbol. The ampersand indicates that a new page is to be prepared, in which case blank lines are written to the rest of the lineprinter page.

The option to continue sends control to the SQA analysis module return point. The module writes the modified program location variables to the system status transfer file, and chains to the chained-from module.

The basic report preparation functions are handled by subroutines. These subroutines format and write: the summary report title; the date and names heading; the filter data; and the footnote.

The summary report title subroutine prepares a formal heading for the first page, and an informal one for subsequent pages. In the case of the latter type of heading, a "&" symbol is written into the records which precede and follow the material. This material is thus designated exclusively for lineprinter output. The subroutine also calls the date-and-names subroutine before returning to the calling point.

The first time that the module calls the date-and-names subroutine, the date and time are acquired, formatted, and written to the list file UVVLPT. In all subsequent calls, only the preformatted lines are output, so that the date and time will be consistent from one page to the next.

In the data-list subroutine, standards data are established and heading lines are written. For intermediate reports only, replicate data for the filter is output. For both intermediate and summary reports, statistics and computed quality control ratings are output. The code for tristimulus and linearity filter output differs slightly.

The footnote subroutine prints a standard message which explains the meaning of the quality control rating symbols.

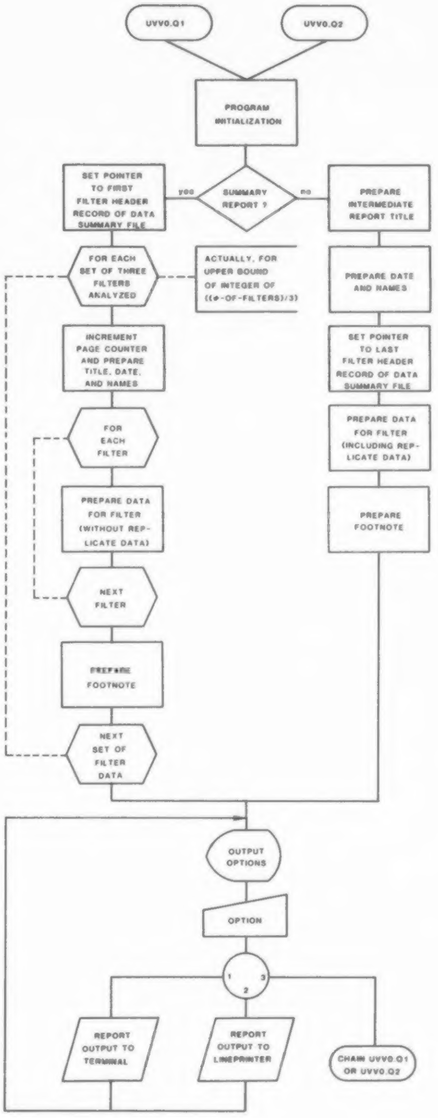

UVV0.Q1
UVV0.Q2
PROGRAM INITIALIZATION
SUMMARY REPORT ?
yes
no
SET POINTER TO FIRST FILTER HEADER RECORD OF DATA SUMMARY FILE
PREPARE INTERMEDIATE REPORT TITLE
FOR EACH SET OF THREE FILTERS ANALYZED
ACTUALLY, FOR UPPER BOUND OF INTEGER OF ((#-OF-FILTERS)/3)
PREPARE DATE AND NAMES
INCREMENT PAGE COUNTER AND PREPARE TITLE, DATE, AND NAMES
SET POINTER TO LAST FILTER HEADER RECORD OF DATA SUMMARY FILE
FOR EACH FILTER
PREPARE DATA FOR FILTER (INCLUDING REPLICATE DATA)
PREPARE DATA FOR FILTER (WITHOUT REPLICATE DATA)
PREPARE FOOTNOTE
NEXT FILTER
PREPARE FOOTNOTE
NEXT SET OF FILTER DATA
OUTPUT OPTIONS
OPTION
1
2
3
REPORT OUTPUT TO TERMINAL
REPORT OUTPUT TO LINEPRINTER
CHAIN UVV0.Q1 OR UVV0.Q2

Figure 7. Flowchart of module UVV0.Q3.

TABLE 11. VARIABLE DESCRIPTIONS FOR MODULE UVVO.Q3

A$	a single-character user-response variable
B$	a character string composed of blanks
D$	a date character string
E1()	the differences between replicate values and corresponding NBS certified values
E2()	the differences between replicate values and historical standards means
E3	the absolute value of one E1 item
E4	the absolute value of one E2 item
F0$	a file name variable
F1$, F2$, F3$	program location variables; see Table 1
F5	a flag used during program initialization; also used by all output preparation subroutines, where: Before subroutine — After subroutine F5 = 0 — F5 = 0 for escape during subroutine F5 = 1 for completed subroutine function
H0	the number of sets of scan data for a particular filter in the historical standards file; H0 never exceeds 25
H1	the pointer to the first set of scan data of a particular filter in the historical standards file
I, I0, J, J0, K, L0	loop-counter and general-purpose variables
L	the line counter
L$	the primary output and output-format character string
L1$, L2$, L3$, L4$, L5$, L6$, L7$, L8$	data-list subroutine output character strings
M	the marker (first item) of each filter header record in the data summary file, where: M = 0 for data not added to historical standards file M = -9999 for data already added to historical stnds. file
M0	an indicator constant of value -9999; various applications
M1, M2, M3	the date of the SQA analysis session (month, day, year)
M4, M5, M6	report date and time variables
M7, M8, M9	the date (month, day, year) of the most recent historical standards update for a particular filter
M()	the results for a particular filter replicate
N0	the filter number (corresponding to its designation)
N0$	the filter designation
N1$, N2$	the analyst's and instrument's names
P	the page counter

TABLE 11. (continued)

P0	the replicate counter (number of scans of a filter)
P1	the replicate pointer (to next available record in UVVOQ.DS)
P2	the pointer to a filter header record in file UVVOQ.SF
R0$	a output character string (for replicate number)
R1$	an output character string for accuracy ratings
R2$	an output character string for precision ratings
R3$	a character string constant used for control ratings
R3	an accuracy control rating indicator for a replicate value
R4	a precision control rating indicator for a replicate value
S0	the filter counter (number of filters analyzed)
S1	the filter pointer (to next header record in UVVOQ.DS)
S3, S4	two and three times the standard deviation of some historical standards mean
S()	the standard deviations of the U means
T()	the NBS certified values for a particular filter
U()	the means of the historical standards values
V$	a general-purpose character string
W$	a control character in each output list file record
W()	the five wavelengths at which the linearity filter percent transmittance values are taken
X	the pointer to the data summary file filter header record of the particular filter being prepared for output

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE  1
                     PROGRAM LISTING FOR UVV0.03

12345678911234567892123456789312345678941234567895123456789612345678970
         0         0         0         0         0         0         0
0010 REM         +++++++++++++++++++++++++++++++++++++++
0020 REM         +   AUTOMATED  ULTRAVIOLET-VISIBLE    +
0030 REM         +      SPECTROPHOTOMETER SYSTEM       +
0040 REM         +   SPECTROPHOTOMETER QUALITY ASSU-   +
0050 REM         +   RANCE ANALYSIS INTERMEDIATE AND   +
0060 REM         +   SUMMARY REPORT MODULE: UVV0.03    +
0070 REM         +   WRITTEN BY GREG ROTH (5/16/80)    +
0080 REM         +   UNIV. OF CINCI. COMPUTER CENTER   +
0090 REM         +   (UVV0.03 CHAINS FROM/TO ANALY-    +
0100 REM         +    SIS MOD'S UVV0.01 AND UVV0.02)   +
0110 REM         +++++++++++++++++++++++++++++++++++++++
0120 REM
0130 REM
0140 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0150 REM
0160 REM                   PROGRAM INITIALIZATION
0170 REM ----------  SET PAGE/ESC/ROUTE-FLAG
0180 PAGE =72
0190 ON ESC THEN GOTO 0490
0200 LET F5=0
0210 ESC
0220 REM ----------  DIM/INIT STRING VARS. AND ARRAYS
0230 DIM F0$[13],F1$[13],F2$[13],F3$[13],L$[72],W$[1]
0240 DIM N0$[5],N1$[20],N2$[20],B$[30],V$[20]
0250 DIM R0$[2],R1$[15],R2$[15],R3$[3],A$[1]
0260 DIM L1$[21],L2$[21],L3$[21],L4$[21]
0270 DIM L5$[24],L6$[24],L7$[24],L8$[24]
0280 DIM M[5],T[5],U[5],S[5],W[5],E1[5],E2[5]
0290 LET W[1]=440
0300 LET W[2]=465
0310 LET W[3]=546.1
0320 LET W[4]=590
0330 LET W[5]=635
0340 FOR I=1 TO 30
0350   LET B$[I,I]=" "
0360 NEXT I
0370 LET R3$="***"
0380 LET M0=-9999
0390 LET L1$="SPEC MEAS'D MEAN  [A]"
0400 LET L2$="NBS CERTIFIED     [B]"
0410 LET L3$="HIST CONTROL MEAN [C]"
0420 LET L4$="HIST CONTROL STD DEV "

12345678911234567892123456789312345678941234567895123456789612345678970
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE  2
                     PROGRAM LISTING FOR UVV0.03

12345678911234567892123456789312345678941234567895123456789612345678970
         0         0         0         0         0         0         0
0430 LET L5$="PRECISION DIFF  [A-C]"
0440 LET L6$="PRECISION RATING (NOTE)"
0450 LET L7$="ACCURACY DIFF   [A-B]"
0460 LET L8$="ACCURACY RATING (NOTE)"
0470 GOTO 0540
0480 REM ----------  ESCAPE DURING INTIALIZATION
0490 NOESC
0500 CLOSE
0510 DIM F0$[13],F1$[13],F2$[13],F3$[13]
0520 LET F5=1
0530 REM ----------  RETRIEVE SYSTEM STATUS PARMS.
0540 LET F0$="UVV00.TR"
0550 OPEN FILE[0,0],F0$,21
0560 READ FILE[0,1],F1$
0570 READ FILE[0,2],F2$
0580 READ FILE[0,3],F3$
0590 READ FILE[0,4],N1$
0600 READ FILE[0,5],N2$
0610 CLOSE FILE[0]
0620 REM   [MODIFY PROGRAM LOCATION VARS.]
0630 LET F1$=F2$
0640 LET F2$=F3$
0650 LET F3$=F1$
0660 IF F5=1 THEN GOTO 2080
0670 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0680 REM
0690 REM                   REPORT PREPARATION
0700 REM ----------  OPEN FILES & SET PAGE # TO ZERO
0710 ON ESC THEN GOTO 2080
0720 LET F0$="UVV00.DS"
0730 OPEN FILE[4,0],F0$,20
0740 READ FILE[4,0],S0,S1,M1,M2,M3
0750 LET F0$="UVV00.VF"
0760 OPEN FILE[3,0],F0$,28
0770 LET F0$="UVV00.SF"
0780 OPEN FILE[5,0],F0$,20
0790 LET F0$="UVVLPT"
0800 OPEN FILE[7,1],F0$
0810 LET P=0
0820 IF F1$="UVV0.01" THEN GOTO 1110
0830 REM ----------  PREPARE INTERMEDIATE REPORT
0840 REM   [TITLE]

12345678911234567892123456789312345678941234567895123456789612345678970
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0850 LET L$="<<<<<<<<<<<<<<<<<<<<  UVVIS  SPEC.  "
0860 LET L$=L$,"INTERMEDIATE  >>>>>>>>>>>>>>>>>>>>"
0870 PRINT FILE[7]
0880 PRINT FILE[7],L$
0890 LET L$[23,48]=" QUALITY ASSURANCE REPORT "
0900 PRINT FILE[7],L$
0910 PRINT FILE[7]
0920 REM   [DATE & NAMES]
0930 LET F5=0
0940 GOSUB 2590
0950 ON ESC THEN GOTO 2080
0960 IF F5=0 THEN GOTO 2080
0970 REM   [DATA]
0980 LET X=S1
0990 LET F5=0
1000 GOSUB 2820
1010 ON ESC THEN GOTO 2080
1020 IF F5=0 THEN GOTO 2080
1030 REM   [FOOTNOTE]
1040 LET F5=0
1050 GOSUB 4090
1060 ON ESC THEN GOTO 2080
1070 IF F5=0 THEN GOTO 2080
1080 CLOSE
1090 GOTO 1410
1100 REM ----------  PREPARE SUMMARY REPORT
1110 LET X=1
1120 FOR I=0 TO (INT((S0-1)/3)*3) STEP 3
1130   LET P=P+1
1140   REM   [TITLE; DATE & NAMES]
1150   LET F5=0
1160   GOSUB 2210
1170   ON ESC THEN GOTO 2080
1180   IF F5=0 THEN GOTO 2080
1190   LET K=S0-I
1200   IF K>3 THEN LET K=3
1210   FOR J=1 TO K
1220     REM   [DATA]
1230     LET F5=0
1240     GOSUB 2820
1250     ON ESC THEN GOTO 2080
1260     IF F5=0 THEN GOTO 2080

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
1270       LET X=P1
1280     NEXT J
1290     IF (I+K)<S0 THEN PRINT FILE[7],"!"
1300     REM   [FOOTNOTE]
1310     LET F5=0
1320     GOSUB 4090
1330     ON ESC THEN GOTO 2080
1340     IF F5=0 THEN GOTO 2080
1350     IF (I+K)<S0 THEN PRINT FILE[7],"!"
1360 NEXT I
1370 CLOSE
1380 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
1390 REM                         REPORT OUTPUT
1400 REM
1410 ON ESC THEN GOTO 2080
1420 ESC
1430 ON ERR THEN GOTO 1510
1440 PRINT
1450 PRINT
1460 PRINT "REPORT OUTPUT:  TERMINAL[1], LINEPRINTER[2], ";
1470 INPUT "CONTINUE[3(CR)]  >>> ",A$
1480 ON ERR THEN STOP
1490 IF LEN(A$)=0 THEN LET A$="3"
1500 ON POS("123",A$,1) THEN GOTO 1560, 1720, 2080
1510 ON ERR THEN STOP
1520 PRINT "<7>"
1530 PRINT "PLEASE ENTER 1, 2, OR 3."
1540 GOTO 1430
1550 REM ----------  TERMINAL OUTPUT
1560 ON ESC THEN GOTO 2010
1570 OPEN FILE[7,3],"UVVLPT"
1580 PRINT
1590 LREAD FILE[7],L$,W$
1600 IF EOF(7)=1 THEN GOTO 2010
1610 LET J=LEN(L$)
1620 IF J>0 THEN LET I=0
1630 IF J=0 THEN LET I=I+1
1640 IF POS("&!",L$,1)>0 THEN GOTO 1680
1650 IF I<=1 THEN LET L$=L$,W$
1660 IF I<=1 THEN PRINT L$;
1670 GOTO 1590
1680 LREAD FILE[7],L$,W$

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE  5
                    PROGRAM LISTING FOR UVV0.Q3

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
1690 IF POS("&!",L$,1)>0 THEN GOTO 1590
1700 GOTO 1680
1710 REM ----------  LINEPRINTER OUTPUT
1720 ON ESC THEN GOTO 2010
1730 OPEN FILE[7,3],"UVVLPT"
1740 ON ERR THEN GOTO 1940
1750 OPEN FILE[1,1],"$LPT"
1760 ON ERR THEN STOP
1770 LET J=1
1780 LET L=0
1790 LREAD FILE[7],L$,W$
1800 IF EOF(7)=1 THEN GOTO 2010
1810 IF L$="!" THEN GOTO 1790
1820 IF L$<>"&" THEN GOTO 1860
1830 LET J=-J
1840 IF J<0 THEN GOTO 1890
1850 GOTO 1790
1860 LET L=L+1
1870 PRINT FILE[1],B$[1,4];L$
1880 GOTO 1790
1890 FOR I=L TO 66
1900   PRINT FILE[1]
1910 NEXT I
1920 GOTO 1780
1930 REM   [LINEPRINTER FILE OPEN]
1940 ON ERR THEN STOP
1950 CLOSE
1960 PRINT "<7>"
1970 PRINT "LINEPRINTER IN USE; WILL WAIT 10 SECS. & RETRY."
1980 DELAY =9
1990 GOTO 1720
2000 REM ----------  ESCAPE DURING OR END OF OUTPUT
2010 NOESC
2020 CLOSE
2030 GOTO 1410
2040 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
2050 REM              SPECTRO. QUALITY ASSURANCE (FILTER)
2060 REM                 ANALYSIS MODULE RETURN POINT
2070 REM
2080 NOESC
2090 CLOSE
2100 LET F0$="UVV00.TR"

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE  6
                    PROGRAM LISTING FOR UVV0.Q3

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2110 OPEN FILE[0,0],F0$,21
2120 WRITE FILE[0,1],F1$
2130 WRITE FILE[0,2],F2$
2140 WRITE FILE[0,3],F3$
2150 CLOSE FILE[0]
2160 CHAIN F3$
2170 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
2180 REM                OUTPUT PREPARATION SUBROUTINES
2190 REM
2200 REM ----------  SUMMARY REPORT TITLE SUBRT.
2210 ON ESC THEN RETURN
2220 IF P>1 THEN GOTO 2460
2230 REM   [FIRST PAGE]
2240 LET L$=B$[1,10],"**************************"
2250 LET L$=L$,L$[11,36]
2260 PRINT FILE[7]
2270 PRINT FILE[7],L$
2280 LET L$=B$[1,10],"*",B$,B$[1,20],"*"
2290 PRINT FILE[7],L$
2300 LET L$=B$[1,10],"*",B$[1,22],"UVVIS",B$[1,23],"*"
2310 PRINT FILE[7],L$
2320 LET L$=B$[1,10],"*",B$,B$[1,20],"*"
2330 PRINT FILE[7],L$
2340 LET L$=B$[1,10],"*  SPECTROPHOTOMETER  QUALITY  "
2350 LET L$=L$,"ASSURANCE  SUMMARY  *"
2360 PRINT FILE[7],L$
2370 LET L$=B$[1,10],"*",B$,B$[1,20],"*"
2380 PRINT FILE[7],L$
2390 LET L$=B$[1,10],"**************************"
2400 LET L$=L$,L$[11,36]
2410 PRINT FILE[7],L$
2420 PRINT FILE[7]
2430 GOSUB 2590
2440 RETURN
2450 REM   [SUBSEQUENT PAGES]
2460 PRINT FILE[7],"&"
2470 LET L$=B$,B$,"   PAGE ##"
2480 PRINT FILE[7],USING L$,P
2490 LET L$=B$[1,24],"UVVIS SPECTROPHOTMETER"
2500 PRINT FILE[7],L$
2510 LET L$=B$[1,23],"QUALITY ASSURANCE SUMMARY"
2520 PRINT FILE[7],L$

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2530 PRINT FILE[7]
2540 GOSUB 2590
2550 ON ESC THEN RETURN
2560 PRINT FILE[7],"&"
2570 RETURN
2580 REM ----------  DATE-AND-NAMES SUBRT.
2590 ON ESC THEN RETURN
2600 IF P>1 THEN GOTO 2680
2610 LET M4=M3-INT(M3/100)*100
2620 LET M6=SYS(0)
2630 LET M5=INT(M6/3600)
2640 LET D$="A.M."
2650 IF M5>=12 THEN LET D$[1,1]="P"
2660 LET M6=INT((M6-M5*3600)/60+.5)
2670 LET M5=M5-INT(M5/13)*12
2680 LET L$=B$[1,19],"DATE/TIME:  ",STR$(M1),"/"
2690 LET L$=L$,STR$(M2),"/",STR$(M4),"  ",STR$(M5),":"
2700 IF M6<10 THEN LET L$=L$,"0"
2710 LET L$=L$,STR$(M6)," ",D$
2720 PRINT FILE[7],L$
2730 LET L$=B$[1,21],"ANALYST:  ",N1$
2740 PRINT FILE[7],L$
2750 LET L$=B$[1,18],"INSTRUMENT:  ",N2$
2760 PRINT FILE[7],L$
2770 PRINT FILE[7]
2780 PRINT FILE[7]
2790 LET F5=1
2800 RETURN
2810 REM ----------  DATA-LIST SUBRT.
2820 ON ESC THEN RETURN
2830 REM   [GET/SET STANDARDS]
2840 READ FILE[4,X],M,N0,P0,P1
2850 READ FILE[3,ABS(N0)],N0$,T[1],T[2],T[3],T[4],T[5]
2860 LET P2=1+28*(ABS(N0)-1)
2870 READ FILE[5,P2],H0,H1,M7,M8,M9
2880 READ FILE[5,(P2+1)],U[1],U[2],U[3],U[4],U[5]
2890 READ FILE[5,(P2+2)],S[1],S[2],S[3],S[4],S[5]
2900 REM   [HEADING]
2910 LET L$="NBS FILTER ",N0$
2920 LET L0=24
2930 IF N0>0 THEN LET L0=23
2940 LET L$=L$,B$[1,L0-LEN(L$)],"MOST RECENT "

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2950 LET L$=L$,"CONTROL STANDARDS UPDATE: ",STR$(M7)
2960 LET L$=L$,"/",STR$(M8),"/",STR$(M9-INT(M9/100)*100)
2970 PRINT FILE[7],L$
2980 PRINT FILE[7]
2990 IF N0>0 THEN LET L$=B$,"    PERCENT TRANSMITTANCE AT:"
3000 IF N0>0 THEN PRINT FILE[7],L$
3010 LET L$="      PARAMETER      "
3020 IF N0>0 THEN LET V$="  ###.# NM"
3030 IF N0<0 THEN LET V$="   TRISTIMULUS #"
3040 IF N0<0 THEN GOTO 3120
3050 LET L$=L$,V$,V$,V$,V$,V$
3060 PRINT FILE[7],USING L$,W[1],W[2],W[3],W[4],W[5]
3070 LET V$="  ---------"
3080 LET L$="-----------------------",V$,V$,V$,V$,V$
3090 PRINT FILE[7],L$
3100 LET V$=" ---#.### "
3110 GOTO 3180
3120 LET L$=L$,V$,V$,V$
3130 PRINT FILE[7],USING L$,"X","Y","Z"
3140 LET V$="   --------------"
3150 LET L$="-------------------------",V$,V$,V$
3160 PRINT FILE[7],L$
3170 LET V$="       --#.##     "
3180 LET L$="SPEC MEAS'D REPLIC ##"
3190 LET L0=3
3200 IF N0>0 THEN LET L0=5
3210 FOR I0=1 TO L0
3220   LET L$=L$,V$
3230 NEXT I0
3240 IF F1$="UVV0.Q1" THEN GOTO 3370
3250 REM   [INTERMEDIATE REPORT DATA]
3260 LET J0=X+2
3270 LET R0$="  "
3280 FOR I0=1 TO P0
3290   LET J0=J0+1
3300   READ FILE[4,J0],M[1],M[2],M[3],M[4],M[5]
3310   IF M[1]=M0 THEN GOTO 3290
3320   LET R0$[2-INT(I0/10),2]=STR$(I0)
3330   IF N0>0 THEN PRINT FILE[7],USING L$,R0$,M[1],M[2],M[3],M[4],M[5
*      ]
3340   IF N0<0 THEN PRINT FILE[7],USING L$,R0$,M[1],M[2],M[3]
3350 NEXT I0

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
12345678911234567892123456789312345678941234567895123456789612345678970
         0         0         0         0         0         0         0
3360 REM   [SUMMARY & INTERM. REPORT DATA]
3370 READ FILE[4,(X+1)],M[1],M[2],M[3],M[4],M[5]
3380 LET R1$=B$[1,15]
3390 LET R2$=R1$
3400 FOR I0=1 TO L0
3410   LET E1[I0]=M[I0]-T[I0]
3420   LET E2[I0]=M[I0]-U[I0]
3430   LET E3=ABS(E1[I0])
3440   LET E4=ABS(E2[I0])
3450   LET S3=S[I0]+S[I0]
3460   LET S4=S3+S[I0]
3470   IF E3>S4 THEN LET R3=2
3480   IF E3>=S3 THEN IF E3<=S4 THEN LET R3=1
3490   IF E3<S3 THEN LET R3=0
3500   IF E4>S4 THEN LET R4=2
3510   IF E4>=S3 THEN IF E4<=S4 THEN LET R4=1
3520   IF E4<S3 THEN LET R4=0
3530   LET J0=1+(I0-1)*3
3540   LET R1$[J0,(J0+R3)]=R3$[1,(1+R3)]
3550   LET R2$[J0,(J0+R4)]=R3$[1,(1+R4)]
3560 NEXT I0
3570 IF N0>0 THEN GOTO 3840
3580 REM   [(FOR TRISTIMULUS FILTERS...)]
3590 LET L$[1,21]=L1$
3600 PRINT FILE[7],USING L$,M[1],M[2],M[3]
3610 LET L$[1,21]=L2$
3620 PRINT FILE[7],USING L$,T[1],T[2],T[3]
3630 LET L$[1,21]=L3$
3640 PRINT FILE[7],USING L$,U[1],U[2],U[3]
3650 LET V$="       --#.###    "
3660 LET L$=L4$,V$,V$,V$
3670 PRINT FILE[7],USING L$,S[1],S[2],S[3]
3680 LET L$[1,21]="#####################"
3690 PRINT FILE[7],USING L$,L7$,E1[1],E1[2],E1[3]
3700 LET V$="        ###      "
3710 LET L$=L8$,V$,V$,V$
3720 PRINT FILE[7],USING L$,R1$[1,3],R1$[4,6],R1$[7,9]
3730 LET V$="       --#.###    "
3740 LET L$="#####################",V$,V$,V$
3750 PRINT FILE[7],USING L$,L5$,E2[1],E2[2],E2[3]
3760 LET V$="        ###      "
3770 LET L$=L6$,V$,V$,V$

12345678911234567892123456789312345678941234567895123456789612345678970
         0         0         0         0         0         0         0
```

```
12345678911234567892123456789312345678941234567895123456789612345678970
         0         0         0         0         0         0         0
3780 PRINT FILE[7],USING L$,R2$[1,3],R2$[4,6],R2$[7,9]
3790 PRINT FILE[7]
3800 PRINT FILE[7]
3810 LET F5=1
3820 RETURN
3830 REM   [(FOR LINEARITY FILTERS...)]
3840 LET L$[1,21]=L1$
3850 PRINT FILE[7],USING L$,M[1],M[2],M[3],M[4],M[5]
3860 LET L$[1,21]=L2$
3870 PRINT FILE[7],USING L$,T[1],T[2],T[3],T[4],T[5]
3880 LET L$[1,21]=L3$
3890 PRINT FILE[7],USING L$,U[1],U[2],U[3],U[4],U[5]
3900 LET V$=" ---#.### "
3910 LET L$=L4$,V$,V$,V$,V$,V$
3920 PRINT FILE[7],USING L$,S[1],S[2],S[3],S[4],S[5]
3930 LET L$[1,21]="#####################"
3940 PRINT FILE[7],USING L$,L7$,E1[1],E1[2],E1[3],E1[4],E1[5]
3950 LET V$="   ###    "
3960 LET L$=L8$,V$,V$,V$,V$,V$
3970 PRINT FILE[7],USING L$,R1$[1,3],R1$[4,6],R1$[7,9],R1$[10,12],R1$[
*     13,15]
3980 LET V$=" ---#.### "
3990 LET L$="#####################",V$,V$,V$,V$,V$
4000 PRINT FILE[7],USING L$,L5$,E2[1],E2[2],E2[3],E2[4],E2[5]
4010 LET V$="  ###     "
4020 LET L$=L6$,V$,V$,V$,V$,V$[1,5]
4030 PRINT FILE[7],USING L$,R2$[1,3],R2$[4,6],R2$[7,9],R2$[10,12],R2$[
*     13,15]
4040 PRINT FILE[7]
4050 PRINT FILE[7]
4060 LET F5=1
4070 RETURN
4080 REM ----------  FOOTNOTE SUBRT.
4090 ON ESC THEN RETURN
4100 LET L$="NOTE:  RATINGS DENOTED BY STAR (*) SYMBOL:"
4110 LET L$=L$,"    * --- IN CONTROL [E<2D];"
4120 PRINT FILE[7],L$
4130 LET L$="** --- WARNING [2D<=E<=3D]  *** --- "
4140 LET L$=L$,"OUT OF CONTROL [E>3D];  WHERE <34>E<34>"
4150 PRINT FILE[7],L$
4160 LET L$="IS ABSOLUTE VAL OF PREC/ACC DIFF., AND <34>D<34>"
4170 LET L$=L$," IS HIST. CONTROL STND. DEV."

12345678911234567892123456789312345678941234567895123456789612345678970
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                         PAGE 11
                   PROGRAM LISTING FOR UVV0.Q3

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
4180 PRINT FILE[7],L$
4190 LET F5=1
4200 RETURN










































1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                         PAGE 12
                             SYMBOL TABLE FOR UVV0.Q3

SYMBOL    REFERENCES
------  ----------------------------------------------------------------
  0490  0190
  0540  0470
  1110  0820
  1410  1090  2030
  1430  1540
  1510  1430
  1560  1500
  1590  1670  1690
  1680  1640  1700
  1720  1500  1990
  1780  1920
  1790  1810  1850  1880
  1860  1820
  1890  1840
  1940  1740
  2010  1560  1600  1720  1800
  2080  0660  0710  0950  0960  1010  1020  1060  1070  1170  1180
        1250  1260  1330  1340  1410  1500
  2210  1160
  2460  2220
  2590  0940  2430  2540
  2680  2600
  2820  1000  1240
  3120  3040
  3180  3110
  3290  3310
  3370  3240
  3840  3570
  4090  1050  1320
  A$    0250  1470  1490  1500
  B$    0240  0350  1870  2240  2280  2300  2320  2340  2370  2390
        2470  2490  2510  2680  2730  2750  2940  2990  3380
  D$    2640  2650  2710
  E1[   0280  3410  3430  3690  3940
  E2[   0280  3420  3440  3750  4000
  E3    3430  3470  3480  3490
  E4    3440  3500  3510  3520
  F0$   0230  0510  0540  0550  0720  0730  0750  0760  0770  0780
        0790  0800  2100  2110
  F1$   0230  0510  0560  0630  0650  0820  2120  3240
  F2$   0230  0510  0570  0630  0640  2130
  F3$   0230  0510  0580  0640  0650  2140  2160
  F5    0200  0520  0660  0930  0960  0990  1020  1040  1070  1150
        1180  1230  1260  1310  1340  2790  3810  4060  4190
  FL#0  0550  0560  0570  0580  0590  0600  0610  2110  2120  2130
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                        PAGE 13
                    SYMBOL TABLE FOR UVV0.Q3

SYMBOL    REFERENCES
------  ----------------------------------------------------------------
        2140  2150
 FL#1   1750  1870  1900
 FL#3   0760  2850
 FL#4   0730  0740  2840  3300  3370
 FL#5   0780  2870  2880  2890
 FL#7   0800  0870  0880  0900  0910  1570  1590  1680  1730  1790
        2260  2270  2290  2310  2330  2360  2380  2410  2420  2460
        2480  2500  2520  2530  2560  2720  2740  2760  2770  2780
        2970  2980  3060  3090  3130  3160  3600  3620  3640  3670
        3690  3720  3750  3780  3790  3800  3850  3870  3890  3920
        3940  3970  4000  4030  4040  4050  4120  4150  4180
 H0     2870
 H1     2870
 I      0340  0350  0360  1120  1190  1290  1350  1360  1620  1630
        1650  1660  1890  1910
 I0     3210  3230  3280  3320  3350  3400  3410  3420  3430  3440
        3450  3460  3530  3560
 J      1210  1280  1610  1620  1630  1770  1830  1840
 J0     3260  3290  3300  3530  3540  3550
 K      1190  1200  1210  1290  1350
 L      1780  1860  1890
 L$     0230  0850  0860  0880  0890  0900  1590  1610  1640  1650
        1660  1680  1690  1790  1810  1820  1870  2240  2250  2270
        2280  2290  2300  2310  2320  2330  2340  2350  2360  2370
        2380  2390  2400  2410  2470  2480  2490  2500  2510  2520
        2680  2690  2700  2710  2720  2730  2740  2750  2760  2910
        2940  2950  2960  2970  2990  3000  3010  3050  3060  3080
        3090  3120  3130  3150  3160  3180  3220  3330  3340  3590
        3600  3610  3620  3630  3640  3660  3670  3680  3690  3710
        3720  3740  3750  3770  3780  3840  3850  3860  3870  3880
        3890  3910  3920  3930  3940  3960  3970  3990  4000  4020
        4030  4100  4110  4120  4130  4140  4150  4160  4170  4180
 L0     2920  2930  2940  3190  3200  3210  3400
 L1$    0260  0390  3590  3840
 L2$    0260  0400  3610  3860
 L3$    0260  0410  3630  3880
 L4$    0260  0420  3660  3910
 L5$    0270  0430  3750  4000
 L6$    0270  0440  3770  4020
 L7$    0270  0450  3690  3940
 L8$    0270  0460  3710  3960
 M      2840
 M0     0380  3310
 M1     0740  2680
 M2     0740  2690
```

```
-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                        PAGE 14
                    SYMBOL TABLE FOR UVV0.Q3

SYMBOL    REFERENCES
------  ----------------------------------------------------------------
 M3     0740  2610
 M4     2610  2690
 M5     2630  2650  2660  2670  2690
 M6     2620  2630  2660  2700  2710
 M7     2870  2950
 M8     2870  2960
 M9     2870  2960
 M[     0280  3300  3310  3330  3340  3370  3410  3420  3600  3850
 N0     2840  2850  2860  2930  2990  3000  3020  3030  3040  3200
        3330  3340  3570
 N0$    0240  2850  2910
 N1$    0240  0590  2730
 N2$    0240  0600  2750
 P      0810  1130  2220  2480  2600
 P0     2840  3280
 P1     1270  2840
 P2     2860  2870  2880  2890
 R0$    0250  3270  3320  3330  3340
 R1$    0250  3380  3390  3540  3720  3970
 R2$    0250  3390  3550  3780  4030
 R3     3470  3480  3490  3540
 R3$    0250  0370  3540  3550
 R4     3500  3510  3520  3550
 S0     0740  1120  1190  1290  1350
 S1     0740  0980
 S3     3450  3460  3480  3490  3510  3520
 S4     3460  3470  3480  3500  3510
 S[     0280  2890  3450  3460  3670  3920
 T[     0280  2850  3410  3620  3870
 U[     0280  2880  3420  3640  3890
 V$     0240  3020  3030  3050  3070  3080  3100  3120  3140  3150
        3170  3220  3650  3660  3700  3710  3730  3740  3760  3770
        3900  3910  3950  3960  3980  3990  4010  4020
 W$     0230  1590  1650  1680  1790
 W[     0280  0290  0300  0310  0320  0330  3060
 X      0980  1110  1270  2840  3260  3370
```

FILE STRUCTURES

The spectrophotometer quality assurance (SQA) analysis modules use and/or create nine files. Below are tables which detail the structures of four of the files. Of the five others, one is UVVLPT, a sequential list file which stores up reports for terminal or lineprinter output. Another is the lineprinter device list file, $LPT. The remaining three files and their structure tables are: 1) the system status transfer file UVVOO.TR, shown in Table 2; 2) the wavelength calibration file UVVOO.CF, shown in Table 3; and 3) the SQA analysis transmittance calibration file UVVOQ.CF, shown in Table 5.

TABLE 12. STRUCTURE OF THE NBS CERTIFIED VALUES FILE

File name: UVVOQ.VF

File type: permanent
fixed-length binary
random access

Record length: 28 bytes

File number: 3

Record	File Content
0	1,0,8
1	"2101",X_1,Y_1,Z_1,-9999,0
2	"2102",X_2,Y_2,Z_2,-9999,0
3	"2103",X_3,Y_3,Z_3,-9999,0
4	"2104",X_4,Y_4,Z_4,-9999,0
5	"2105",X_5,Y_5,Z_5,-9999,0
6	"1-282",$T_{6,1}$,$T_{6,2}$,$T_{6,3}$,$T_{6,4}$,$T_{6,5}$
7	"2-282",$T_{7,1}$,$T_{7,2}$,$T_{7,3}$,$T_{7,4}$,$T_{7,5}$
8	"3-282",$T_{8,1}$,$T_{8,2}$,$T_{8,3}$,$T_{8,4}$,$T_{8,5}$

Where:

X_I,Y_I,Z_I are the tristimulus values of the Ith filter

$T_{K,I}$ is the percent transmittance of the Kth specified wavelength of the Ith filter

Note 1: in record 0, the first and second items are used for validity check; the third item is number of filters.

Note 2: -9999 marks all tristimulus filters.

TABLE 13. STRUCTURE OF THE SQA DATA SUMMARY FILE

File name: UVVOQ.DS

File type: fixed-length binary random access

Record length: 20 bytes

File number: 4

Record	File content
0	S0,S1,M1,M2,M3
1	M,N0,P0,P1 (filter header record)
2	U_1,U_2,U_3,U_4,U_5
3	S_1,S_2,S_3,S_4,S_5
4	M_1,M_2,M_3,M_4,M_5
.	.
.	.
.	.
etc.	etc.

Note: When there is more than one filter header record, the P1 of the *ith* filter header record will point to the *(i+1)th* filter header record.

Where:

S0 is filter counter
S1 is filter header record pointer
M1,M2,M3 are month, day, year of analysis
M is filter header record file marker
N0 is filter number
P0 is replicate counter
P1 is replicate record pointer
$U_1,\ldots,U_5$ are mean % transmittance or tristimulus values
$S_1,\ldots,S_5$ are standard deviations of U means
$M_1,\ldots,M_5$ are replicate % transmittance or tristimulus values

TABLE 14. STRUCTURE OF THE SQA HISTORICAL STANDARDS FILE

File name: UVVOQ.SF

Record length: 20 bytes

File type: fixed-length binary random access

File number: 5

Record	File content
0	1,0
1	H0,H1,D1,D2,D3 ("2101" header record)
2	X',Y',Z',
3	X",Y",Z",
4	X_I,Y_I,Z_I
.	.
.	.
29	H0,H1,D1,D2,D3 ("2102" header record)
.	.
.	.
57	H0,H1,D1,D2,D3 ("2103" header record)
.	.
.	.
85	H0,H1,D1,D2,D3 ("2104" header record)
.	.
.	.
113	H0,H1,D1,D2,D3 ("2105" header record)
.	.
.	.
141	H0,H1,D1,D2,D3 ("1-282" header record)
142	T1',T2',T3',T4',T5'
143	T1",T2",T3",T4",T5"
144	$T1_I,T2_I,T3_I,T4_I,T5_I$
.	.
.	.
169	H0,H1,D1,D2,D3 ("2-282" header record)
.	.
.	.
197	H0,H1,D1,D2,D3 ("3-282" header record)
.	.
.	.
etc.	etc.

Where:

H0 is number of replicates for particular filter
H1 is pointer to oldest replicate of a particular filter
D1,D2,D3 are month, day, and year of most recent update of a particular filter
X',Y',Z' are mean tristimulus values for a tristimulus filter
X",Y",Z" are standard deviations of the tristimulus means
X_I,Y_I,Z_{Z_I} are tristimulus values of some Ith tristimulus filter replicate
T1',T2',T3',T4',T5' are mean percent transmittance values for a linearity filter
T1",T2",T3",T4",T5" are standard deviations of percent transmittance means
$T1_I,T2_I,T3_I,T4_I,T5_I$ are percent transmittance values for some Ith linearity filter replicate

Note 1: the first and second items of record zero are used for file-existence check

Note 2: the filter header record for the ith filter is at record [28*(i-1)+1]

TABLE 15. STRUCTURE OF THE 30-SELECTED-ORDINATE METHOD FILE

File name: UVV00.SF

Record length: 8 bytes

Record	File content
0	1,0
1	W_I, S_I
2	W_2, S_2
.	. .
.	. .
.	. .
90	W_{90}, S_{90}

Note: the items in record zero are used for file validity check

File type: permanent fixed-length binary random access

File number: 6 in UVV0.Q2
7 in UVV0.L2

Where:

W_I is some wavelength (in nanometers) and $W_I \leq W_{(I+1)}$ for $I = 1, 2, \ldots, 89$

S_I indicates to which tristimulus value (tristimulus X, Y, or Z) accumulator the percent transmittance value at wavelength W_I is to be added, where:

$S_I = 1$ for tristimulus X accumulator

$S_I = 2$ for tristimulus Y accumulator

$S_I = 3$ for tristimulus Z accumulator

SECTION 6

CHLOROPHYLL ANALYSIS

Six modules comprise the automated and manual data-entry chlorophyll analysis functions. There is a pair of modules (UVVO.C1 and UVVO.C2) for automated analysis operations, a corresponding pair (UVVO.C0 and UVVO.C5) for manual analysis operations, and a pair of report modules (UVVO.C3 and UVVO.C4) accessed by the other four.

UVVO.C1 and UVVO.C0 are the main command modules which prepare sample analyses, delete sample data, and call the summary report module UVVO.C3. UVVO.C1 also facilitates the checking and/or setting of the transmittance calibration and the scanning mechanism speed.

UVVO.C2 and UVVO.C5 handle sample scanning (or data entry), data reduction, replicate deletion, and sample reporting. The last function is accomplished by chaining to the module UVVO.C4.

AUTOMATED CHLOROPHYLL ANALYSIS MODULE -- UVVO.C1

UVVO.C1 is chained to from UVVO.00 or from any of its called modules (UVVO.T0, UVVO.C2, or UVVO.C3). It retrieves system status, wavelength calibration, and chlorophyll run parameters. A nonexistent run parameters file (UVVOC.RP) necessitates default initialization of the run parameters. (Consult Tables 16 and 19.)

The module begins by examining the sample-run flag. When this flag indicates that the run has just begun, an option is given to examine and/or change the run parameters. When this operation is carried out, a response-process subroutine deals with each input as a character string, a single-character flag, or a numeric entry, depending on the status of the flag F5.

The run parameters are written into the run parameters file. The command line is dispatched to the terminal and a command is received.

The transmittance calibration check/set command is processed as it is in UVVO.Q1. However, in UVVO.C1, the transmittance calibration file is UVVOC.CF, and the scan range wavelength bounds are different. Treatment of the "M" command is elucidated in the section on the Scanning Mechanism Speed Checking/Setting Routine.

In the chlorophyll summary report section, no inquiry is made of the number of samples analyzed. A chain is made to the "destination" program UVVO.C3 via the exit point.

For the first chlorophyll sample analysis command of the run, the module seeks a proper transmittance calibration file. Provided the file exists, the chlorophyll data summary file, plot reference file, and plot data file are deleted and initialized. (These files are UVVOC.DS, UVVOC.PR, and UVVO.PF, respectively.)

For any chlorophyll sample analysis command, the module proceeds by retrieving the most recent sample header record from the data summary file. This record and the following one include the dilution factor, mean sample volume, and mean biomass. These parameters, along with a new sample identifier, are established and written to the data summary file. All sample identifiers are eight characters long, and any blanks are changed to zeroes. If defined by the system, the sample identifier has the form SMMDDNNN, where S is the character "S", MM is the month date, DD is the day date, and NNN is the sample numbering counter. The "destination" program is defined as UVVO.C2, and a branch is made to the module exit point.

The sample deletion section contains three options: 1) list samples analyzed; 2) delete sample by identifier; and 3) delete sample by list number. Option 1 must precede option 3. For the first option, only undeleted samples are listed. For the second and third options, a search is made according to list number or identifier, and if found, the marker of the sample header record is altered. (See the explanation of the file UVVOC.DS and the variable M.) Also, the corresponding data block in the plot reference file is found, and the first major heading is altered to read "IDENTIFIER: XXXXXXXX - DELETED", where XXXXXXXX is the sample identifier left intact. A successful or unsuccessful operation is so noted and flow returns to the command line.

The chlorophyll analysis ending section begins with setting the sample-run flag to indicate the start of a run. Thus, the next inquiry of this flag will be correctly perceived as a sign to begin a new session. The "destination" program is declared to be UVVO.00, and module flow drops to the exit point.

At the program exit point, new program location variables are written to the system status transfer file. The module then chains to the "destination" program.

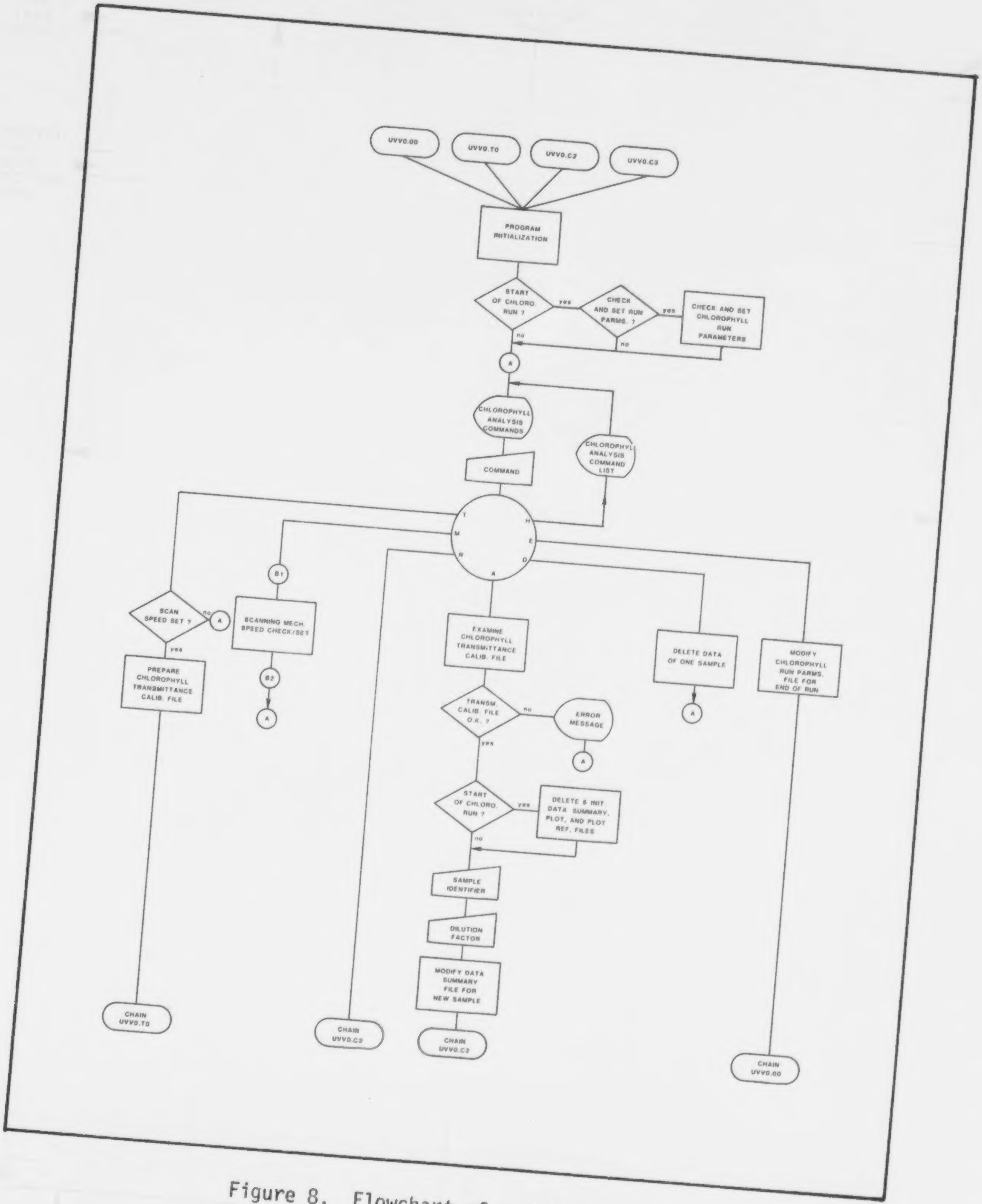

UVV0.00
UVV0.T0
UVV0.C2
UVV0.C3
PROGRAM INITIALIZATION
START OF CHLORO. RUN ?
yes
CHECK AND SET RUN PARMS. ?
yes
CHECK AND SET CHLOROPHYLL RUN PARAMETERS
no
no
A
CHLOROPHYLL ANALYSIS COMMANDS
COMMAND
CHLOROPHYLL ANALYSIS COMMAND LIST
T
H
M
E
R
D
A
B1
SCAN SPEED SET ?
no
A
yes
PREPARE CHLOROPHYLL TRANSMITTANCE CALIB. FILE
SCANNING MECH. SPEED CHECK/SET
B2
A
EXAMINE CHLOROPHYLL TRANSMITTANCE CALIB. FILE
TRANSM. CALIB. FILE O.K. ?
no
ERROR MESSAGE
A
yes
START OF CHLORO. RUN ?
yes
DELETE & INIT DATA SUMMARY, PLOT, AND PLOT REF. FILES
no
SAMPLE IDENTIFIER
DILUTION FACTOR
MODIFY DATA SUMMARY FILE FOR NEW SAMPLE
DELETE DATA OF ONE SAMPLE
A
MODIFY CHLOROPHYLL RUN PARMS. FILE FOR END OF RUN
CHAIN UVV0.T0
CHAIN UVV0.C3
CHAIN UVV0.C2
CHAIN UVV0.00

Figure 8. Flowchart of module UVV0.C1.

TABLE 16. VARIABLE DESCRIPTIONS FOR MODULES UVVO.C1 and UVVO.C0

A$	a single-character user-response variable
A2*	an accumulator used by CALL 257
B	the average biomass of the most recent sample
B0*	the number of data blocks in the chlorophyll plot reference file
C0$	the chlorophyll analysis command line
C2*	the CALL 257 indicator number for scan-clear (for stop)
C5*	the transmittance signal channel number
C6*	the wavelength signal channel number
C7*	the CALL 7 channel-indicator number
D	the dilution factor for the most recent sample
D7*	the CALL 7 initial time delay (in sixtieth seconds)
D8*	the CALL 7 between-signal pairs time delay (in sixtieth seconds)
E	the extract volume of the chlorophyll run
F0$	a file name variable
F1$, F2$, F3$	program location variables; see Table 1
F4	a flag used during program initialization
F5	a flag used by the response-processing subroutine, where:

Before subroutine	After subroutine
F5 = 1 for character string	F5 = 1 for escape during subroutine F5 = 0 for no input (accept) F5 = 2 for new input (change)
F5 = 2 for character flag	F5 = 2 for escape during subroutine F5 = 0 for no input (accept) F5 = 1 for improper input F5 = 3 for new input (change)
F5 = 3 for numeric entry	F5 = 3 for escape during subroutine F5 = 0 for no input (accept) F5 = 1 for improper input F5 = 2 for new input (change)

I	a loop-counter and general-purpose variable
I0$	the character string of user-chosen run-parameter flags
I1$	the character string of all possible run-parameter flags
I2$	a substring of I1$, used by the response-processing subroutine
J, K, L	loop-counter and general-purpose variables
L0	the cell path length for the chlorophyll run
L$*	an output and output-format character string

TABLE 16. (Continued)

M	the marker (first item) of each record in the data summary file, where: M = 0 for a normal data record M = 1 for a sample header record M = -1 for a deleted sample header record M = 2 for a replicate header record M = -2 for a deleted replicate header record M = N for sample counter in record 0 where integer $N \geq 0$
N1$, N2$	the analyst's and instrument's names
N3$	the input character string of the response-processing subroutine
N4$	a character string composed of valid numeric characters
N7*	the number of A/D counts to be put in the VO scan array
P	a branching and general purpose variable
PO	the replicate counter (number of replicates of a sample)
P1	the replicate pointer (to next replicate header record in UVVOC.DS)
Q1*, Q2*, Q3*	the constants of the wavelength calibration equation
R*	the computed scan speed (in nanometers per minute)
RO*	the expected scan speed (in nanometers per minute)
R1$, R2$, R3$	chlorophyll run-parameter character strings R1$ the station or study R2$ the extraction method R3$ a comment for the run
S$	the sample identifier
SO	the sample counter (number of samples analyzed)
S1	the sample pointer (to next sample header record in UVVOC.DS)
S2	the sample numbering counter (kept and deleted samples)
V	the mean sample volume/area of the most recent sample
V$	a general-purpose character string
VO *	the CALL 7 scan (data storage) array
W*	a general-purpose variable usually representing wavelength
WO*, W1*	the lower and upper scan range wavelength bounds
X, Y	general-purpose variables usually representing wavelength

* Starred variables are used in UVVO.C1 only.

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                       PAGE  1
                      PROGRAM LISTING FOR UVV0.C1

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0010 REM          +++++++++++++++++++++++++++++++++++++++++
0020 REM          +    AUTOMATED  ULTRAVIOLET-VISIBLE     +
0030 REM          +       SPECTROPHOTOMETER SYSTEM        +
0040 REM          +    AUTOMATED CHLOROPHYLL ANALYSIS     +
0050 REM          +           MODULE:  UVV0.C1            +
0060 REM          +    WRITTEN BY GREG ROTH (4/11/80)     +
0070 REM          +    UNIV. OF CINCI. COMPUTER CENTER    +
0080 REM          +    (ORIG. WRITER: P. SILL, 3/23/76    +
0090 REM          +    MODIFIED: C. BRODBECK, 12/27/76    +
0100 REM          +    REWRITTEN: D.RYAN, 10/1/77, UCCC)  +
0110 REM          +++++++++++++++++++++++++++++++++++++++++
0120 REM
0130 REM
0140 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0150 REM                PROGRAM INITIALIZATION
0160 REM
0170 REM ----------  SET PAGE/ESC/ROUTE-FLAG
0180 PAGE =72
0190 LET F4=0
0200 ON ESC THEN GOTO 0330
0210 ESC
0220 REM ----------  DIM/INIT STRING VARS. AND ARRAYS
0230 DIM A$[1],C0$[7],S$[8]
0240 DIM F0$[13],F1$[13],F2$[13],F3$[13]
0250 DIM N1$[20],N2$[20],N3$[20],N4$[12]
0260 DIM R1$[18],R2$[18],R3$[20],I0$[6],I1$[11],I2$[3]
0270 DIM L$[42],V$[8]
0280 DIM V0[22]
0290 LET C0$="TMRADEH"
0300 LET N4$="0123456789-."
0310 LET I1$="PEANMFKIUSJ"
0320 GOTO 0380
0330 NOESC
0340 CLOSE
0350 DIM F0$[13],F1$[13],F2$[13],F3$[13]
0360 LET F4=1
0370 REM ----------  GET SYSTEM STATUS PARMS.
0380 LET F0$="UVV00.TR"
0390 OPEN FILE[0,0],F0$,21
0400 READ FILE[0,1],F1$
0410 READ FILE[0,2],F2$
0420 READ FILE[0,3],F3$

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                       PAGE  2
                      PROGRAM LISTING FOR UVV0.C1

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0430 READ FILE[0,4],N1$
0440 READ FILE[0,5],N2$
0450 READ FILE[0,6],C5,C6,C7
0460 CLOSE FILE[0]
0470 REM   [MODIFY PROGRAM LOCATION VARS.]
0480 LET F1$=F2$
0490 LET F2$=F3$
0500 LET F3$=""
0510 IF F4=1 THEN GOTO 6150
0520 REM ----------  RETRIEVE WAVELENGTH CALIBRATION PARMS.
0530 ON ESC THEN GOTO 6150
0540 LET F0$="UVV00.CF"
0550 OPEN FILE[1,0],F0$,20
0560 READ FILE[1,1],Q1,Q2,Q3
0570 CLOSE FILE[1]
0580 REM ----------  RETRIEVE CHLOROPHYLL RUN PARMS.
0590 LET F0$="UVV0C.RP"
0600 OPEN FILE[3,0],F0$,21
0610 ON ERR THEN GOTO 0670
0620 READ FILE[3,0],R1$
0630 READ FILE[3,1],R2$
0640 READ FILE[3,2],R3$
0650 READ FILE[3,3],I0$
0660 READ FILE[3,4],E,L
0670 CLOSE FILE[3]
0680 IF F1$<>"UVV0.00" THEN GOTO 1800
0690 IF LEN(I0$)=6 THEN IF I0$[1,1]="M" THEN GOTO 1800
0700 IF LEN(I0$)=6 THEN GOTO 0770
0710 LET I0$="SPAMIU"
0720 GOTO 0880
0730 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0740 REM            CHLOROPHYLL RUN PARAMETERS SECTION
0750 REM
0760 REM ----------  CHECK/SET RUN PARMS. OPTION-SELECT
0770 ON ERR THEN GOTO 0850
0780 PRINT
0790 PRINT "CHECK AND/OR CHANGE DEFAULT RUN PARAMETERS?";
0800 INPUT "  [N(CR) OR Y]  >>> ",A$
0810 ON ERR THEN STOP
0820 IF LEN(A$)=0 THEN GOTO 1570
0830 IF A$="N" THEN GOTO 1570
0840 IF A$="Y" THEN GOTO 0880

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE  3
                    PROGRAM LISTING FOR UVV0.C1

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0850 ON ERR THEN STOP
0860 PRINT "<7>"
0870 GOTO 0770
0880 LET F5=1
0890 PRINT
0900 PRINT "STATION/STUDY :"; TAB(35);R1$
0910 GOSUB 6300
0920 ON ESC THEN GOTO 6150
0930 ON F5 THEN GOTO 6150, 0960
0940 LET R1$=N3$[1,18]
0950 GOTO 0880
0960 LET F5=2
0970 LET I2$=I1$[1,2]
0980 PRINT "SAMPLE TYPE: PLANKTON [P] OR PERIPHYTON [E] : ";I0$[2,2]
0990 GOSUB 6300
1000 ON ESC THEN GOTO 6150
1010 ON F5 THEN GOTO 0960, 6150, 1040
1020 LET I0$[2,2]=N3$
1030 GOTO 0960
1040 LET F5=3
1050 PRINT "EXTRACT VOLUME (ML) :"; TAB(34);E
1060 GOSUB 6300
1070 ON ESC THEN GOTO 6150
1080 ON F5 THEN GOTO 1040, 1110, 6150
1090 LET E=VAL(N3$)
1100 GOTO 1040
1110 LET F5=1
1120 PRINT "EXTRACTION METHOD :"; TAB(35);R2$
1130 GOSUB 6300
1140 ON ESC THEN GOTO 6150
1150 ON F5 THEN GOTO 6150, 1180
1160 LET R2$=N3$[1,18]
1170 GOTO 1110
1180 LET F5=3
1190 PRINT "CELL PATH LENGTH (CM) :"; TAB(34);L
1200 GOSUB 6300
1210 ON ESC THEN GOTO 6150
1220 ON F5 THEN GOTO 1180, 1250, 6150
1230 LET L=VAL(N3$)
1240 GOTO 1180
1250 IF L=0 THEN PRINT "<7>";
1260 IF L=0 THEN GOTO 1180

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE  4
                    PROGRAM LISTING FOR UVV0.C1

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
1270 LET F5=2
1280 LET I2$=I1$[9,11]
1290 PRINT "COMPUTATION METHOD [U,S,J] : "; TAB(35);I0$[6,6]
1300 GOSUB 6300
1310 ON ESC THEN GOTO 6150
1320 ON F5 THEN GOTO 1270, 6150, 1350
1330 LET I0$[6,6]=N3$
1340 GOTO 1270
1350 FOR I=3 TO 5
1360   LET F5=2
1370   LET J=(I-1)*2
1380   LET I2$=I1$[J-1,J]
1390   IF I=3 THEN PRINT "SAMPLES ACIDIFIED [A] OR NOT [N] : ";
1400   IF I=4 THEN PRINT "METHOD [M] OR FOUND [F] PEAK ABS : ";
1410   IF I=5 THEN PRINT "BIOMASS KNOWN [K] OR IGNORED [I] : ";
1420   PRINT  TAB(35);I0$[I,I]
1430   GOSUB 6300
1440   ON ESC THEN GOTO 6150
1450   ON F5 THEN GOTO 1360, 6150, 1480
1460   LET I0$[I,I]=N3$
1470   GOTO 1360
1480 NEXT I
1490 LET F5=1
1500 PRINT "COMMENT :"; TAB(35);R3$
1510 GOSUB 6300
1520 ON ESC THEN GOTO 6150
1530 ON F5 THEN GOTO 6150, 1570
1540 LET R3$=N3$
1550 GOTO 1490
1560 REM ----------  SAVE NEW RUN PARAMETERS
1570 LET F0$="UVVOC.RP"
1580 OPEN FILE[3,0],F0$,21
1590 WRITE FILE[3,0],R1$
1600 WRITE FILE[3,1],R2$
1610 WRITE FILE[3,2],R3$
1620 WRITE FILE[3,3],I0$
1630 WRITE FILE[3,4],E,L,SYS(2),SYS(1),SYS(3)
1640 CLOSE FILE[3]
1650 GOTO 1800
1660 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
1670 REM               CHLOROPHYLL ANALYSIS COMMAND LEVEL
1680 REM

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
1690 REM ----------  CHLOROPHYLL ANALYSIS COMMAND LIST
1700 ON ESC THEN GOTO 1800
1710 PRINT
1720 PRINT "T  ---  TRANSMITTANCE CALIBRATION; CHECK AND/OR SET"
1730 PRINT "M  ---  SCANNING MECHANISM SPEED; CHECK AND/OR SET"
1740 PRINT "R  ---  SUMMARY CHLOROPHYLL REPORT"
1750 PRINT "A  ---  ANALYSIS OF ONE SAMPLE"
1760 PRINT "D  ---  DELETION OF DATA OF ONE SAMPLE"
1770 PRINT "E  ---  END OF CHLOROPHYLL ANALYSIS"
1780 PRINT "H  ---  HELP"
1790 REM ----------  CHLOROPHYLL ANALYSIS COMMAND SELECT
1800 ON ESC THEN GOTO 6150
1810 ESC
1820 ON ERR THEN GOTO 1920
1830 PRINT
1840 PRINT
1850 PRINT "CHLOROPHYLL ANALYSIS COMMANDS:  ";
1860 INPUT "T, M, R, A, D, E, H(CR)  >>> ",A$
1870 ON ERR THEN STOP
1880 IF LEN(A$)=0 THEN LET A$="H"
1890 ON ERR THEN STOP
1900 LET P=POS(C0$,A$,1)
1910 ON P THEN GOTO 1990, 2270, 3370, 3440, 5020, 6030, 1700
1920 ON ERR THEN STOP
1930 PRINT "<7>"
1940 PRINT "INVALID COMMAND."
1950 GOTO 1820
1960 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
1970 REM        TRANSMITTANCE CALIBRATION CHECK/SET SECTION
1980 REM
1990 ON ESC THEN GOTO 1800
2000 LET R=0
2010 LET F0$="UVV0C.CF"
2020 OPEN FILE[2,0],F0$,8
2030 ON ESC THEN GOTO 2150
2040 ON ERR THEN GOTO 2180
2050 READ FILE[2,1],X,R
2060 ON ERR THEN STOP
2070 LET W1=760
2080 LET W0=620
2090 WRITE FILE[2,2],W1,W0
2100 CLOSE FILE[2]

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2110 IF R<=0 THEN GOTO 2200
2120 NOESC
2130 LET F3$="UVV0.T0"
2140 GOTO 6200
2150 NOESC
2160 CLOSE FILE[2]
2170 GOTO 1800
2180 NOESC
2190 CLOSE FILE[2]
2200 ON ESC THEN GOTO 1800
2210 PRINT "<7>"
2220 PRINT "SCANNING MECHANISM SPEED NOT YET SET."
2230 GOTO 1800
2240 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
2250 REM        SCANNING MECH. SPEED CHECK/SET SECTION
2260 REM
2270 ON ESC THEN GOTO 1800
2280 LET D7=0
2290 LET D8=60
2300 LET R=0
2310 LET F0$="UVV0C.CF"
2320 OPEN FILE[2,0],F0$,8
2330 ON ESC THEN GOTO 2380
2340 ON ERR THEN GOTO 2410
2350 READ FILE[2,1],X,R
2360 CLOSE FILE[2]
2370 GOTO 2460
2380 NOESC
2390 CLOSE FILE[2]
2400 GOTO 1800
2410 ON ERR THEN STOP
2420 NOESC
2430 LET R=0
2440 CLOSE FILE[2]
2450 REM ----------  SCANNING MECH. SPEED OPTION-SELECT
2460 ON ESC THEN GOTO 1800
2470 ESC
2480 ON ERR THEN GOTO 2560
2490 PRINT
2500 PRINT "SCAN MECH. SPEED:  ";
2510 INPUT "CHECK[1], SET[2], OR CONTINUE[3(CR)]  >>> ",A$
2520 ON ERR THEN STOP

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVV0.C1

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
 2530 IF LEN(A$)=0 THEN LET A$="3"
 2540 LET P=POS("123",A$,1)
 2550 ON P THEN GOTO 2610, 2610, 1800
 2560 ON ERR THEN STOP
 2570 PRINT "<7>"
 2580 PRINT "PLEASE ENTER 1, 2, OR 3(CR)"
 2590 GOTO 2480
 2600 REM -----------  SCAN MECH. SPEED CHECK/SET INSTRS.
 2610 ON ESC THEN GOTO 3220
 2620 LET V$="CHECK"
 2630 IF P=2 THEN LET V$="SET"
 2640 PRINT
 2650 PRINT "SCANNING MECHANISM SPEED ";V$;":"
 2660 PRINT  TAB(10);"1.  SET WAVELENGTH AT SCANNING MID-RANGE."
 2670 PRINT  TAB(10);"2.  SET SPECTRO. FOR SCAN OPERATION AND ";
 2680 ON ERR THEN GOTO 2720
 2690 INPUT "PRESS CR KEY. ",A$
 2700 ON ERR THEN STOP
 2710 IF LEN(A$)=0 THEN GOTO 2760
 2720 ON ERR THEN STOP
 2730 PRINT "<7>"
 2740 PRINT  TAB(14);
 2750 GOTO 2680
 2760 LET N7=2+P*10
 2770 ON ESC THEN GOTO 3260
 2780 CALL 7,C7,D7,D8,N7,V0[1]
 2790 ON ESC THEN GOTO 3220
 2800 IF P=2 THEN GOTO 2910
 2810 REM   [SCAN SPEED CHECK RESULTS]
 2820 LET W=Q1+V0[4]*(Q2+Q3*V0[4])
 2830 LET Y=Q1+V0[12]*(Q2+Q3*V0[12])
 2840 LET R0=INT(((W-Y)*15)/5+.5)*5
 2850 PRINT
 2860 PRINT USING "EXPECTED SPEED: ### NM/MIN  ",R;
 2870 PRINT USING "MEAS'D SPEED: ### NM/MIN  ",R0;
 2880 PRINT USING "DIFF: -### NM/MIN",(R0-R)
 2890 GOTO 2460
 2900 REM   [SCAN SPEED SET RESULTS]
 2910 LET W=Q1+V0[6]*(Q2+Q3*V0[6])
 2920 LET X=Q1+V0[14]*(Q2+Q3*V0[14])
 2930 LET Y=Q1+V0[22]*(Q2+Q3*V0[22])
 2940 LET W=(W-X)*15

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVV0.C1

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
 2950 LET Y=(X-Y)*15
 2960 LET X=ABS(Y-W)/((Y+W)/2)
 2970 IF X<5E-02 THEN GOTO 3020
 2980 PRINT "<7>"
 2990 PRINT "MEASURED SCAN SPEED VARIED FROM ";
 3000 PRINT USING "###.## NM/MIN  TO  ###.## NM/MIN",W,Y
 3010 GOTO 2460
 3020 LET R=(W+Y)/2
 3030 LET R=INT(R/5+.5)*5
 3040 PRINT
 3050 PRINT "MEASURED SCAN SPEED IS APPROX.";R;"NM/MIN."
 3060 ON ERR THEN GOTO 3130
 3070 PRINT
 3080 INPUT "IGNORE NEWLY SET SCAN SPEED ?  [N(CR) OR Y]  >>> ",A$
 3090 ON ERR THEN STOP
 3100 IF LEN(A$)=0 THEN GOTO 3160
 3110 IF A$="N" THEN GOTO 3160
 3120 IF A$="Y" THEN GOTO 2460
 3130 ON ERR THEN STOP
 3140 PRINT "<7>"
 3150 GOTO 3060
 3160 OPEN FILE[2,0],F0$,8
 3170 ON ESC THEN GOTO 3220
 3180 WRITE FILE[2,1],SYS(3),R
 3190 CLOSE FILE[2]
 3200 GOTO 2460
 3210 REM   [ESC FROM SCAN CHECK/SET]
 3220 NOESC
 3230 CLOSE
 3240 GOTO 2460
 3250 REM   [ESC FROM CALL 7]
 3260 LET C2=24823
 3270 LET A2=0
 3280 ON ERR THEN GOTO 3320
 3290 CALL 257,C2,A2
 3300 ON ERR THEN STOP
 3310 GOTO 2460
 3320 PRINT "<7>"
 3330 PRINT "ERROR IN CALL 257 SCAN-STOP."
 3340 GOTO 2460
 3350 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 3360 REM             CHLOROPHYLL SUMMARY REPORT SECTION

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
3370 NOESC
3380 CLOSE
3390 LET F3$="UVV0.C3"
3400 GOTO 6200
3410 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
3420 REM                CHLOROPHYLL SAMPLE ANALYSIS SECTION
3430 REM
3440 ON ESC THEN GOTO 4960
3450 LET D=0
3460 LET V=0
3470 LET B=0
3480 IF I0$[1,1]="M" THEN GOTO 4030
3490 LET F0$="UVV0C.CF"
3500 OPEN FILE[2,0],F0$,8
3510 ON ERR THEN GOTO 3570
3520 READ FILE[2,1],X,R
3530 READ FILE[2,2],W1,W0
3540 READ FILE[2,(W1-W0+3)],X,Y
3550 CLOSE FILE[2]
3560 GOTO 3620
3570 NOESC
3580 CLOSE
3590 PRINT "<7>"
3600 PRINT "INSUFFICIENT TRANSMITTANCE CALIBRATION DATA."
3610 GOTO 1800
3620 ON ERR THEN GOTO 3640
3630 DELETE "UVV0C.DS"
3640 ON ERR THEN GOTO 3660
3650 DELETE "UVV0C.PR"
3660 ON ERR THEN GOTO 3680
3670 DELETE "UVV0C.PF"
3680 ON ERR THEN STOP
3690 LET F0$="UVV0C.DS"
3700 LET S0=0
3710 LET S1=1
3720 LET S2=0
3730 OPEN FILE[4,0],F0$,32
3740 WRITE FILE[4,0],S0,S1,S2
3750 CLOSE FILE[4]
3760 LET F0$="UVV0C.PR"
3770 LET X=0
3780 ON ERR THEN GOTO 3800

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
3790 RENAME F0$,F0$
3800 ON ERR THEN STOP
3810 IF SYS(7)=-48 THEN DELAY =1
3820 IF SYS(7)=-48 THEN GOTO 3780
3830 OPEN FILE[6,0],F0$,41
3840 WRITE FILE[6,0],B0,SYS(2),SYS(1),SYS(3)
3850 LET L$=N1$
3860 FOR I=(LEN(L$)+1) TO 20
3870   LET L$=L$," "
3880 NEXT I
3890 LET L$=L$,N2$
3900 WRITE FILE[6,1],L$
3910 CLOSE FILE[6]
3920 LET F0$="UVV0C.PF"
3930 LET X=1
3940 ON ERR THEN GOTO 3960
3950 RENAME F0$,F0$
3960 ON ERR THEN STOP
3970 IF SYS(7)=-48 THEN DELAY =1
3980 IF SYS(7)=-48 THEN GOTO 3940
3990 OPEN FILE[5,0],F0$,4
4000 WRITE FILE[5,0],X
4010 CLOSE FILE[5]
4020 GOTO 4180
4030 LET F0$="UVV0C.DS"
4040 OPEN FILE[4,0],F0$,32
4050 READ FILE[4,0],S0,S1,S2
4060 LET J=S1
4070 FOR I=(S1-1) TO 1 STEP -1
4080   READ FILE[4,I],M
4090   IF M<>1 THEN GOTO 4120
4100   LET J=I
4110   GOTO 4130
4120 NEXT I
4130 IF J=S1 THEN GOTO 4160
4140 READ FILE[4,J],M,P0,P1,S$,D
4150 READ FILE[4,J+1],M,V,X,Y,B
4160 CLOSE FILE[4]
4170 REM ----------  SET SAMPLE PARAMETERS
4180 ON ESC THEN GOTO 1800
4190 LET S$=""
4200 ON ERR THEN GOTO 4260

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-’-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE 11
                     PROGRAM LISTING FOR UVVO.C1

 1234567891123456789212345678931234567894123456789512345678961234567897
          0         0         0         0         0         0         0
 4210 PRINT
 4220 PRINT "SAMPLE ID :  [USER-SET OR AUTOMATIC(CR)]";
 4230 INPUT "  >>> ",S$
 4240 ON ERR THEN STOP
 4250 GOTO 4290
 4260 ON ERR THEN STOP
 4270 PRINT "<7>"
 4280 GOTO 4200
 4290 IF LEN(S$)>0 THEN GOTO 4380
 4300 LET S$="S0000000"
 4310 LET V$=STR$(SYS(2))
 4320 LET S$[3-LEN(V$)+1,3]=V$
 4330 LET V$=STR$(SYS(1))
 4340 LET S$[5-LEN(V$)+1,5]=V$
 4350 LET V$=STR$(S2+1)
 4360 LET S$[8-LEN(V$)+1,8]=V$
 4370 GOTO 4500
 4380 LET K=LEN(S$)
 4390 FOR I=(K+1) TO 8
 4400   LET S$[I,I]=" "
 4410 NEXT I
 4420 FOR I=8 TO 1 STEP -1
 4430   LET J=K+I-8
 4440   IF J>=1 THEN GOTO 4470
 4450   LET S$[I,I]="0"
 4460   GOTO 4490
 4470   IF S$[J,J]=" " THEN LET S$[J,J]="0"
 4480   LET S$[I,I]=S$[J,J]
 4490 NEXT I
 4500 LET F5=1
 4510 PRINT
 4520 PRINT "SAMPLE ID :  "; TAB(35);S$
 4530 GOSUB 6300
 4540 ON ESC THEN GOTO 1800
 4550 ON F5 THEN GOTO 1800, 4580
 4560 LET S$=N3$[1,8]
 4570 GOTO 4380
 4580 LET F0$="UVVOC.DS"
 4590 OPEN FILE[4,0],F0$,32
 4600 READ FILE[4,0],S0,S1,S2
 4610 LET J=1
 4620 LET K=0

 1234567891123456789212345678931234567894123456789512345678961234567897
          0         0         0         0         0         0         0
```

```
A-U-T-’-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE 12
                     PROGRAM LISTING FOR UVVO.C1

 1234567891123456789212345678931234567894123456789512345678961234567897
          0         0         0         0         0         0         0
 4630 FOR I=1 TO S0
 4640   READ FILE[4,J],M,P0,P1,V$
 4650   LET J=P1
 4660   IF M=-1 THEN GOTO 4640
 4670   IF V$=S$ THEN LET K=1
 4680 NEXT I
 4690 CLOSE FILE[4]
 4700 IF K=0 THEN GOTO 4740
 4710 PRINT "<7>"
 4720 PRINT "SAMPLE ";S$;" ALREADY EXISTS."
 4730 GOTO 4190
 4740 LET F5=3
 4750 PRINT "DILUTION FACTOR : "; TAB(34);D
 4760 GOSUB 6300
 4770 ON ESC THEN GOTO 1800
 4780 ON F5 THEN GOTO 4740, 4810, 1800
 4790 LET D=VAL(N3$)
 4800 GOTO 4740
 4810 IF D>0 THEN GOTO 4840
 4820 PRINT "<7>"
 4830 GOTO 4740
 4840 LET F0$="UVVOC.DS"
 4850 OPEN FILE[4,0],F0$,32
 4860 ON ESC THEN GOTO 4960
 4870 READ FILE[4,0],S0,S1,S2
 4880 LET M=1
 4890 LET P0=0
 4900 LET P1=S1+11
 4910 WRITE FILE[4,S1],M,P0,P1,S$,D
 4920 CLOSE FILE[4]
 4930 NOESC
 4940 LET F3$="UVVO.C2"
 4950 GOTO 6200
 4960 NOESC
 4970 CLOSE FILE[4]
 4980 GOTO 1800
 4990 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 5000 REM                SAMPLE (ONE) DELETION SECTION
 5010 REM
 5020 ON ESC THEN GOTO 1800
 5030 ON ERR THEN GOTO 5130
 5040 PRINT

 1234567891123456789212345678931234567894123456789512345678961234567897
          0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVVO.C1

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
5050 PRINT "SAMPLE DELETION:";
5060 PRINT "  LIST SAMPLES[1], DELETE BY ID[2],"
5070 PRINT  TAB(18);"DELETE BY LIST NUMBER[3], CONTINUE[4(CR)]";
5080 INPUT "  >>> ",A$
5090 ON ERR THEN STOP
5100 IF LEN(A$)=0 THEN LET A$="4"
5110 LET P=POS("1234",A$,1)
5120 ON P THEN GOTO 5180, 5350, 5620, 1800
5130 ON ERR THEN STOP
5140 PRINT "<7>"
5150 PRINT "PLEASE ENTER 1, 2, 3, OR 4."
5160 GOTO 5030
5170 REM ----------  LIST SAMPLES
5180 ON ESC THEN GOTO 5970
5190 LET F0$="UVVOC.DS"
5200 OPEN FILE[4,0],F0$,32
5210 READ FILE[4,0],S0,S1,S2
5220 PRINT
5230 LET P1=1
5240 FOR I=1 TO S0
5250   LET J=P1
5260   READ FILE[4,J],M,P0,P1,S$
5270    IF M<>1 THEN GOTO 5250
5280   LET K=I-INT((I-1)/3)*3-1
5290   PRINT  TAB(5+K*20);STR$(I);" -- ";S$;
5300    IF K=2 THEN PRINT
5310 NEXT I
5320 CLOSE FILE[4]
5330 GOTO 5020
5340 REM ----------  DELETE SAMPLE BY ID
5350 ON ESC THEN GOTO 5970
5360 ON ERR THEN GOTO 5560
5370 PRINT
5380 INPUT "      SAMPLE ID : ",V$
5390 ON ERR THEN STOP
5400 IF LEN(V$)<>8 THEN GOTO 5560
5410 LET F0$="UVVOC.DS"
5420 OPEN FILE[4,0],F0$,32
5430 READ FILE[4,0],S0,S1,S2
5440 LET P1=1
5450 LET L=0
5460 FOR I=1 TO S0

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVVO.C1

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
5470   LET J=P1
5480   READ FILE[4,J],M,P0,P1,S$
5490    IF M<>1 THEN GOTO 5470
5500    IF P=2 THEN IF V$=S$ THEN LET L=J
5510    IF P=3 THEN IF K=I THEN LET L=J
5520    IF L=J THEN GOTO 5540
5530 NEXT I
5540 IF L>0 THEN GOTO 5730
5550 CLOSE FILE[4]
5560 ON ERR THEN STOP
5570 PRINT "<7>"
5580 IF P=2 THEN PRINT "      SAMPLE ";V$;" NOT FOUND."
5590 IF P=3 THEN PRINT "      SAMPLE LIST NUMBER NOT FOUND."
5600 GOTO 5020
5610 REM ----------  DELETE SAMPLE BY LIST NUMBER
5620 ON ESC THEN GOTO 5970
5630 ON ERR THEN GOTO 5690
5640 PRINT
5650 PRINT "      SAMPLE LIST NUMBER (1 TO ";STR$(S0);")";
5660 INPUT "  >>> ",K
5670 ON ERR THEN STOP
5680 IF K>0 THEN IF K<=S0 THEN IF K=INT(K) THEN GOTO 5410
5690 ON ERR THEN STOP
5700 PRINT "<7>"
5710 PRINT "INCORRECT LIST NUMBER."
5720 GOTO 5630
5730 WRITE FILE[4,L],(-M)
5740 LET S0=S0-1
5750 WRITE FILE[4,0],S0,S1,S2
5760 CLOSE FILE[4]
5770 LET F0$="UVVOC.PR"
5780 ON ERR THEN GOTO 5800
5790 RENAME F0$,F0$
5800 ON ERR THEN STOP
5810 IF SYS(7)=-48 THEN DELAY =1
5820 IF SYS(7)=-48 THEN GOTO 5780
5830 OPEN FILE[6,0],F0$,41
5840 READ FILE[6,0],B0
5850 FOR I=1 TO B0
5860   LET J=3+(I-1)*5
5870   READ FILE[6,J],L$
5880    IF POS(L$,S$,1)=0 THEN GOTO 5910

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVV0.C1

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
5890   LET L$[21,30]=" - DELETED"
5900   WRITE FILE[6,J],L$
5910 NEXT I
5920 CLOSE FILE[6]
5930 PRINT
5940 PRINT "SAMPLE ";S$;" HAS BEEN DELETED."
5950 GOTO 1800
5960 REM   [ESC FROM SAMPLE DELETION]
5970 NOESC
5980 CLOSE
5990 GOTO 1800
6000 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
6010 REM                CHLOROPHYLL ANALYSIS ENDING SECTION
6020 REM
6030 ON ESC THEN GOTO 6110
6040 LET F0$="UVV0C.RP"
6050 OPEN FILE[3,0],F0$,21
6060 READ FILE[3,3],I0$
6070 LET I0$[1,1]="S"
6080 WRITE FILE[3,3],I0$
6090 CLOSE FILE[3]
6100 GOTO 6150
6110 NOESC
6120 CLOSE
6130 GOTO 1800
6140 REM ----------  EXIT TO MCL
6150 NOESC
6160 PRINT
6170 CLOSE
6180 LET F3$="UVV0.00"
6190 REM ----------  EXIT POINT
6200 LET F0$="UVV00.TR"
6210 OPEN FILE[0,0],F0$,21
6220 WRITE FILE[0,1],F1$
6230 WRITE FILE[0,2],F2$
6240 WRITE FILE[0,3],F3$
6250 CLOSE
6260 CHAIN F3$
6270 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
6280 REM                 RESPONSE-PROCESSING SUBROUTINE
6290 REM
6300 ON ESC THEN RETURN

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVV0.C1

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
6310 ON ERR THEN GOTO 6350
6320 INPUT "          [KEEP(CR) OR CHANGE]  >>> ",N3$
6330 ON ERR THEN STOP
6340 GOTO 6400
6350 ON ERR THEN STOP
6360 PRINT "<7>"
6370 PRINT "INVALID RESPONSE."
6380 PRINT  TAB(35);
6390 GOTO 6310
6400 ON F5 THEN GOTO 6440, 6470, 6550
6410 PRINT "<7>"
6420 PRINT "ERROR F5=";F5
6430 STOP
6440 LET F5=0
6450 IF LEN(N3$)=0 THEN LET F5=2
6460 RETURN
6470 ON (LEN(N3$)+1) THEN GOTO 6490, 6510
6480 GOTO 6660
6490 LET F5=3
6500 RETURN
6510 LET P=POS(I2$,N3$,1)
6520 IF P=0 THEN GOTO 6660
6530 LET F5=0
6540 RETURN
6550 IF LEN(N3$)>0 THEN GOTO 6580
6560 LET F5=2
6570 RETURN
6580 FOR I=1 TO LEN(N3$)
6590   IF POS(N4$,N3$[I,I],1)=0 THEN GOTO 6660
6600 NEXT I
6610 ON ERR THEN GOTO 6660
6620 IF VAL(N4$)=VAL(N4$) THEN GOTO 6630
6630 ON ERR THEN STOP
6640 LET F5=0
6650 RETURN
6660 LET F5=1
6670 PRINT "<7>"
6680 PRINT "INVALID RESPONSE."
6690 RETURN

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                         PAGE 17
                        SYMBOL TABLE FOR UVVO.C1

SYMBOL    REFERENCES
------  ------------------------------------------------------------------

 0330   0200
 0380   0320
 0670   0610
 0770   0700  0870
 0850   0770
 0880   0720  0840  0950
 0960   0930  1010  1030
 1040   1010  1080  1100
 1110   1080  1170
 1180   1150  1220  1240  1260
 1250   1220
 1270   1320  1340
 1350   1320
 1360   1450  1470
 1480   1450
 1490   1550
 1570   0820  0830  1530
 1700   1910
 1800   0680  0690  1650  1700  1990  2170  2200  2230  2270  2400
        2460  2550  3610  4180  4540  4550  4770  4780  4980  5020
        5120  5950  5990  6130
 1820   1950
 1920   1820
 1990   1910
 2150   2030
 2180   2040
 2200   2110
 2270   1910
 2380   2330
 2410   2340
 2460   2370  2890  3010  3120  3200  3240  3310  3340
 2480   2590
 2560   2480
 2610   2550
 2680   2750
 2720   2680
 2760   2710
 2910   2800
 3020   2970
 3060   3150
 3130   3060
 3160   3100  3110
 3220   2610  2790  3170
 3260   2770
 3320   3280
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                         PAGE 18
                        SYMBOL TABLE FOR UVVO.C1

SYMBOL    REFERENCES
------  ------------------------------------------------------------------

 3370   1910
 3440   1910
 3570   3510
 3620   3560
 3640   3620
 3660   3640
 3680   3660
 3780   3820
 3800   3780
 3940   3980
 3960   3940
 4030   3480
 4120   4090
 4130   4110
 4160   4130
 4180   4020
 4190   4730
 4200   4280
 4260   4200
 4290   4250
 4380   4290  4570
 4470   4440
 4490   4460
 4500   4370
 4580   4550
 4640   4660
 4740   4700  4780  4800  4830
 4810   4780
 4840   4810
 4960   3440  4860
 5020   1910  5330  5600
 5030   5160
 5130   5030
 5180   5120
 5250   5270
 5350   5120
 5410   5680
 5470   5490
 5540   5520
 5560   5360  5400
 5620   5120
 5630   5720
 5690   5630
 5730   5540
 5780   5820
```

```
A-U-T-´-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE 19
                         SYMBOL TABLE FOR UVV0.C1

SYMBOL    REFERENCES
------  -----------------------------------------------------------------
 5800   5780
 5910   5880
 5970   5180  5350  5620
 6030   1910
 6110   6030
 6150   0510  0530  0920  0930  1000  1010  1070  1080  1140  1150
        1210  1220  1310  1320  1440  1450  1520  1530  1800  6100
 6200   2140  3400  4950
 6300   0910  0990  1060  1130  1200  1300  1430  1510  4530  4760
 6310   6390
 6350   6310
 6400   6340
 6440   6400
 6470   6400
 6490   6470
 6510   6470
 6550   6400
 6580   6550
 6630   6620
 6660   6480  6520  6590  6610
 A$     0230  0800  0820  0830  0840  1860  1880  1900  2510  2530
        2540  2690  2710  3080  3100  3110  3120  5080  5100  5110
 A2     3270  3290
 B      3470  4150
 B0     3840  5840  5850
 C0$    0230  0290  1900
 C2     3260  3290
 C5     0450
 C6     0450
 C7     0450  2780
 D      3450  4140  4750  4790  4810  4910
 D7     2280  2780
 D8     2290  2780
 E      0660  1050  1090  1630
 F0$    0240  0350  0380  0390  0540  0550  0590  0600  1570  1580
        2010  2020  2310  2320  3160  3490  3500  3690  3730  3760
        3790  3830  3920  3950  3990  4030  4040  4580  4590  4840
        4850  5190  5200  5410  5420  5770  5790  5830  6040  6050
        6200  6210
 F1$    0240  0350  0400  0480  0680  6220
 F2$    0240  0350  0410  0480  0490  6230
 F3$    0240  0350  0420  0490  0500  2130  3390  4940  6180  6240
        6260
 F4     0190  0360  0510
 F5     0880  0930  0960  1010  1040  1080  1110  1150  1180  1220
```

```
A-U-T-´-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE 20
                         SYMBOL TABLE FOR UVV0.C1

SYMBOL    REFERENCES
------  -----------------------------------------------------------------
        1270  1320  1360  1450  1490  1530  4500  4550  4740  4780
        6400  6420  6440  6450  6490  6530  6560  6640  6660
 FL#0   0390  0400  0410  0420  0430  0440  0450  0460  6210  6220
        6230  6240
 FL#1   0550  0560  0570
 FL#2   2020  2050  2090  2100  2160  2190  2320  2350  2360  2390
        2440  3160  3180  3190  3500  3520  3530  3540  3550
 FL#3   0600  0620  0630  0640  0650  0660  0670  1580  1590  1600
        1610  1620  1630  1640  6050  6060  6080  6090
 FL#4   3730  3740  3750  4040  4050  4080  4140  4150  4160  4590
        4600  4640  4690  4850  4870  4910  4920  4970  5200  5210
        5260  5320  5420  5430  5480  5550  5730  5750  5760
 FL#5   3990  4000  4010
 FL#6   3830  3840  3900  3910  5830  5840  5870  5900  5920
 I      1350  1370  1390  1400  1410  1420  1460  1480  3860  3880
        4070  4080  4100  4120  4390  4400  4410  4420  4430  4450
        4480  4490  4630  4680  5240  5280  5290  5310  5460  5510
        5530  5850  5860  5910  6580  6590  6600
 I0$    0260  0650  0690  0700  0710  0980  1020  1290  1330  1420
        1460  1620  3480  6060  6070  6080
 I1$    0260  0310  0970  1280  1380
 I2$    0260  0970  1280  1380  6510
 J      1370  1380  4060  4100  4130  4140  4150  4430  4440  4470
        4480  4610  4640  4650  5250  5260  5470  5480  5500  5510
        5520  5860  5870  5900
 K      4380  4390  4430  4620  4670  4700  5280  5290  5300  5510
        5660  5680
 L      0660  1190  1230  1250  1260  1630  5450  5500  5510  5520
        5540  5730
 L$     0270  3850  3860  3870  3890  3900  5870  5880  5890  5900
 M      4080  4090  4140  4150  4640  4660  4880  4910  5260  5270
        5480  5490  5730
 N1$    0250  0430  3850
 N2$    0250  0440  3890
 N3$    0250  0940  1020  1090  1160  1230  1330  1460  1540  4560
        4790  6320  6450  6470  6510  6550  6580  6590
 N4$    0250  0300  6590  6620
 N7     2760  2780
 P      1900  1910  2540  2550  2630  2760  2800  5110  5120  5500
        5510  5580  5590  6510  6520
 P0     4140  4640  4890  4910  5260  5480
 P1     4140  4640  4650  4900  4910  5230  5250  5260  5440  5470
        5480
 Q1     0560  2820  2830  2910  2920  2930
 Q2     0560  2820  2830  2910  2920  2930
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE 21
                          SYMBOL TABLE FOR UVV0.C1

SYMBOL    REFERENCES
------  -----------------------------------------------------------------
 Q3     0560  2820  2830  2910  2920  2930
 R      2000  2050  2110  2300  2350  2430  2860  2880  3020  3030
        3050  3180  3520
 R0     2840  2870  2880
 R1$    0260  0620  0900  0940  1590
 R2$    0260  0630  1120  1160  1600
 R3$    0260  0640  1500  1540  1610
 S$     0230  4140  4190  4230  4290  4300  4320  4340  4360  4380
        4400  4450  4470  4480  4520  4560  4670  4720  4910  5260
        5290  5480  5500  5880  5940
 S0     3700  3740  4050  4600  4630  4870  5210  5240  5430  5460
        5650  5680  5740  5750
 S1     3710  3740  4050  4060  4070  4130  4600  4870  4900  4910
        5210  5430  5750
 S2     3720  3740  4050  4350  4600  4870  5210  5430  5750
 V      3460  4150
 V$     0270  2620  2630  2650  4310  4320  4330  4340  4350  4360
        4640  4670  5380  5400  5500  5580
 VO[    0280  2780  2820  2830  2910  2920  2930
 W      2820  2840  2910  2940  2960  3000  3020
 W0     2080  2090  3530  3540
 W1     2070  2090  3530  3540
 X      2050  2350  2920  2940  2950  2960  2970  3520  3540  3770
        3930  4000  4150
 Y      2830  2840  2930  2950  2960  3000  3020  3540  4150
```

MANUAL DATA-ENTRY CHLOROPHYLL ANALYSIS MODULE -- UVVO.CO

Since UVVO.CO is very similar to the automated chlorophyll analysis module UVVO.C1, the following material serves only to expound the key differences between the two modules. The variable descriptions for UVVO.CO are found in Table 16.

UVVO.CO is chained to from UVVO.00 or from any of its called modules (UVVO.C5 or UVVO.C3). The program initialization procedure is the same for UVVO.CO as for UVVO.C1, except that the wavelength calibration parameters need not be retrieved.

The setting of chlorophyll run parameters for the manual analysis requires that one additional flag be defined: the data-entry flag. This flag specifies that raw data are to be entered in either absorbance units or percent transmittance values.

All automated chlorophyll analysis functions are available in UVVO.CO, barring the commands and code for the calibration check/set and the scanning mechanism speed check/set. The summary report, end of session, and help commands activate code which is identical to that in UVVO.C1.

In the chlorophyll sample analysis section, there is no need to deal with the transmittance calibration, plot reference, and plot data files. Only the data summary file need be initialized and/or updated. The chain to UVVO.C2 is replaced by a chain to the manual chlorophyll sample analysis module UVVO.C5.

The sample deletion operation imitates that of UVVO.C1, but there is no need to update the plot reference file.

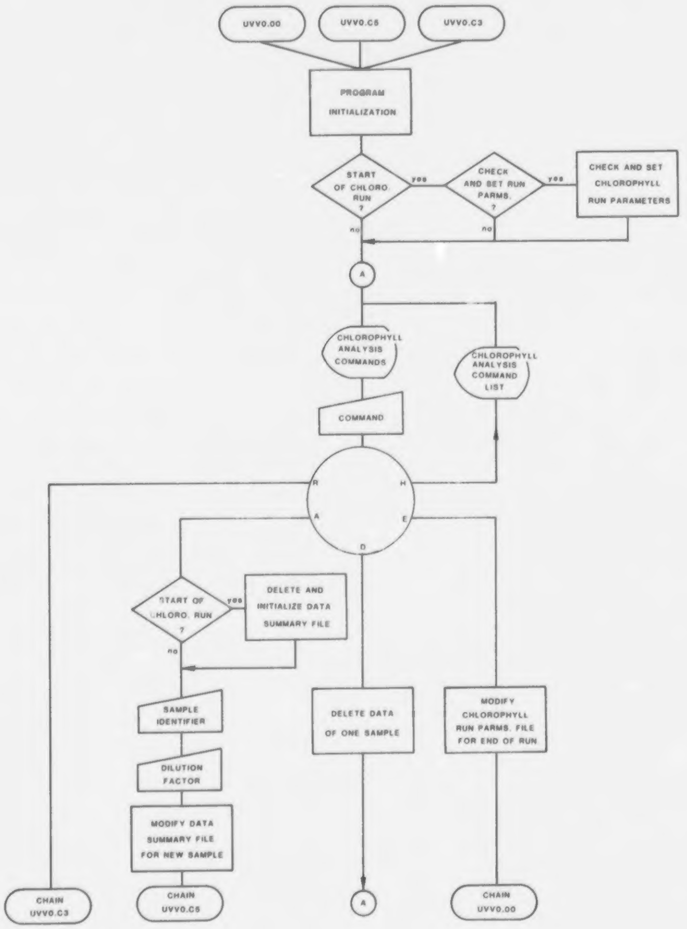

UVV0.00
UVV0.C5
UVV0.C3
PROGRAM INITIALIZATION
START OF CHLORO. RUN ?
yes
CHECK AND SET RUN PARMS. ?
yes
CHECK AND SET CHLOROPHYLL RUN PARAMETERS
no
no
A
CHLOROPHYLL ANALYSIS COMMANDS
CHLOROPHYLL ANALYSIS COMMAND LIST
COMMAND
R
H
A
E
D
START OF CHLORO. RUN ?
yes
DELETE AND INITIALIZE DATA SUMMARY FILE
no
SAMPLE IDENTIFIER
DILUTION FACTOR
MODIFY DATA SUMMARY FILE FOR NEW SAMPLE
DELETE DATA OF ONE SAMPLE
MODIFY CHLOROPHYLL RUN PARMS. FILE FOR END OF RUN
CHAIN UVV0.C3
CHAIN UVV0.C5
A
CHAIN UVV0.00

Figure 9. Flowchart of module UVVO.CO.

```
A-U-T-'-D  U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                         PAGE  1
                     PROGRAM LISTING FOR UVV0.CO

12345678911234567892123456789312345678941234567895123456789612345678970
         0         0         0         0         0         0         0
0010 REM          ++++++++++++++++++++++++++++++++++++++
0020 REM          +    AUTOMATED  ULTRAVIOLET-VISIBLE   +
0030 REM          +       SPECTROPHOTOMETER SYSTEM      +
0040 REM          +    MANUAL DATA ENTRY  CHLOROPHYLL   +
0050 REM          +      ANALYSIS  MODULE:  UVV0.CO     +
0060 REM          +    WRITTEN BY GREG ROTH (4/14/80)   +
0070 REM          +    UNIV. OF CINCI. COMPUTER CENTER  +
0080 REM          +    (ORIG. WRITER: P. SILL, 3/23/76  +
0090 REM          +    MODIFIED: C. BRODBECK, 12/27/76  +
0100 REM          +    REWRITTEN: D.RYAN, 10/1/77, UCCC) +
0110 REM          ++++++++++++++++++++++++++++++++++++++
0120 REM
0130 REM
0140 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0150 REM                 PROGRAM INITIALIZATION
0160 REM
0170 REM ----------  SET PAGE/ESC/ROUTE-FLAG
0180 PAGE =72
0190 LET F4=0
0200 ON ESC THEN GOTO 0310
0210 ESC
0220 REM ----------  DIM/INIT STRING VARS. AND ARRAYS
0230 DIM A$[1],C0$[5],S$[8],V$[8]
0240 DIM F0$[13],F1$[13],F2$[13],F3$[13]
0250 DIM N1$[20],N2$[20],N3$[20],N4$[12]
0260 DIM R1$[18],R2$[18],R3$[20],I0$[7],I1$[13],I2$[3]
0270 LET C0$="RADEH"
0280 LET N4$="0123456789-."
0290 LET I1$="PEANMFKIUSJAT"
0300 GOTO 0360
0310 NOESC
0320 CLOSE
0330 DIM F0$[13],F1$[13],F2$[13],F3$[13]
0340 LET F4=1
0350 REM ----------  GET SYSTEM STATUS PARMS.
03[illegible] [illegible] F0$="UVV00.TR"
0370 OPEN FILE[0,0],F0$,21
0380 READ FILE[0,1],F1$
0390 READ FILE[0,2],F2$
0400 READ FILE[0,3],F3$
0410 READ FILE[0,4],N1$
0420 READ FILE[0,5],N2$

12345678911234567892123456789312345678941234567895123456789612345678970
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                         PAGE  2
                     PROGRAM LISTING FOR UVV0.CO

12345678911234567892123456789312345678941234567895123456789612345678970
         0         0         0         0         0         0         0
0430 CLOSE FILE[0]
0440 REM   [MODIFY PROGRAM LOCATION VARS.]
0450 LET F1$=F2$
0460 LET F2$=F3$
0470 LET F3$=""
0480 IF F4=1 THEN GOTO 4130
0490 REM ----------  RETRIEVE CHLOROPHYLL RUN PARMS.
0500 ON ESC THEN GOTO 4130
0510 LET F0$="UVV0C.RP"
0520 OPEN FILE[3,0],F0$,21
0530 ON ERR THEN GOTO 0590
0540 READ FILE[3,0],R1$
0550 READ FILE[3,1],R2$
0560 READ FILE[3,2],R3$
0570 READ FILE[3,3],I0$
0580 READ FILE[3,4],E,L0
0590 CLOSE FILE[3]
0600 IF F1$<>"UVV0.00" THEN GOTO 1780
0610 IF LEN(I0$)=7 THEN IF I0$[1,1]="M" THEN GOTO 1780
0620 IF LEN(I0$)=7 THEN GOTO 0690
0630 LET I0$="SPAMIUA"
0640 GOTO 0800
0650 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0660 REM             CHLOROPHYLL RUN PARAMETERS SECTION
0670 REM
0680 REM ----------  CHECK/SET RUN PARMS. OPTION-SELECT
0690 ON ERR THEN GOTO 0770
0700 PRINT
0710 PRINT "CHECK AND/OR CHANGE DEFAULT RUN PARAMETERS?";
0720 INPUT "  [N(CR) OR Y]  >>> ",A$
0730 ON ERR THEN STOP
0740 IF LEN(A$)=0 THEN GOTO 1570
0750 IF A$="N" THEN GOTO 1570
0760 IF A$="Y" THEN GOTO 0800
0770 ON ERR THEN STOP
0780 PRINT "<7>"
0790 GOTO 0690
0800 LET F5=1
0810 PRINT
0820 PRINT "STATION/STUDY :"; TAB(35);R1$
0830 GOSUB 4280
0840 ON ESC THEN GOTO 4130

12345678911234567892123456789312345678941234567895123456789612345678970
         0         0         0         0         0         0         0
```

```
A-U-T-´-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE  3
                    PROGRAM LISTING FOR UVV0.CO

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0850 ON F5 THEN GOTO 4130, 0880
0860 LET R1$=N3$[1,18]
0870 GOTO 0800
0880 LET F5=2
0890 LET I2$=I1$[1,2]
0900 PRINT "SAMPLE TYPE: PLANKTON [P] OR PERIPHYTON [E] : ";I0$[2,2]
0910 GOSUB 4280
0920 ON ESC THEN GOTO 4130
0930 ON F5 THEN GOTO 0880, 4130, 0960
0940 LET I0$[2,2]=N3$
0950 GOTO 0880
0960 LET F5=3
0970 PRINT "EXTRACT VOLUME (ML) :"; TAB(34);E
0980 GOSUB 4280
0990 ON ESC THEN GOTO 4130
1000 ON F5 THEN GOTO 0960, 1030, 4130
1010 LET E=VAL(N3$)
1020 GOTO 0960
1030 LET F5=1
1040 PRINT "EXTRACTION METHOD :"; TAB(35);R2$
1050 GOSUB 4280
1060 ON ESC THEN GOTO 4130
1070 ON F5 THEN GOTO 4130, 1100
1080 LET R2$=N3$[1,18]
1090 GOTO 1030
1100 LET F5=3
1110 PRINT "CELL PATH LENGTH (CM) :"; TAB(34);L0
1120 GOSUB 4280
1130 ON ESC THEN GOTO 4130
1140 ON F5 THEN GOTO 1100, 1170, 4130
1150 LET L0=VAL(N3$)
1160 GOTO 1100
1170 IF L0=0 THEN PRINT "<7>";
1180 IF L0=0 THEN GOTO 1100
1190 LET F5=2
1200 LET I2$=I1$[9,11]
1210 PRINT "COMPUTATION METHOD [U,S,J] : "; TAB(35);I0$[6,6]
1220 GOSUB 4280
1230 ON ESC THEN GOTO 4130
1240 ON F5 THEN GOTO 1190, 4130, 1270
1250 LET I0$[6,6]=N3$
1260 GOTO 1190

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-´-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE  4
                    PROGRAM LISTING FOR UVV0.CO

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
1270 FOR I=3 TO 5
1280   LET F5=2
1290   LET J=(I-1)*2
1300   LET I2$=I1$[J-1,J]
1310   IF I=3 THEN PRINT "SAMPLES ACIDIFIED [A] OR NOT [N] : ";
1320   IF I=4 THEN PRINT "METHOD [M] OR FOUND [F] PEAK ABS : ";
1330   IF I=5 THEN PRINT "BIOMASS KNOWN [K] OR IGNORED [I] : ";
1340   PRINT  TAB(35);I0$[I,I]
1350   GOSUB 4280
1360   ON ESC THEN GOTO 4130
1370   ON F5 THEN GOTO 1280, 4130, 1400
1380   LET I0$[I,I]=N3$
1390   GOTO 1280
1400 NEXT I
1410 LET F5=2
1420 LET I2$=I1$[12,13]
1430 PRINT "DATA ENTRY: ABSORB.[A] OR %-TRANS.[T] : ";I0$[7,7]
1440 GOSUB 4280
1450 ON ESC THEN GOTO 4130
1460 ON F5 THEN GOTO 1410, 4130, 1490
1470 LET I0$[7,7]=N3$
1480 GOTO 1410
1490 LET F5=1
1500 PRINT "COMMENT :"; TAB(35);R3$
1510 GOSUB 4280
1520 ON ESC THEN GOTO 4130
1530 ON F5 THEN GOTO 4130, 1570
1540 LET R3$=N3$
1550 GOTO 1490
1560 REM ----------  SAVE NEW RUN PARAMETERS
1570 LET F0$="UVVOC.RP"
1580 OPEN FILE[3,0],F0$,21
1590 WRITE FILE[3,0],R1$
1600 WRITE FILE[3,1],R2$
1610 WRITE FILE[3,2],R3$
1620 WRITE FILE[3,3],I0$
1630 WRITE FILE[3,4],E,L0,SYS(2),SYS(1),SYS(3)
1640 CLOSE FILE[3]
1650 GOTO 1780
1660 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
1670 REM                CHLOROPHYLL ANALYSIS COMMAND LEVEL
1680 REM

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVV0.CO

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
1690 REM ----------  CHLOROPHYLL ANALYSIS COMMAND LIST
1700 ON ESC THEN GOTO 1780
1710 PRINT
1720 PRINT "R  ---  SUMMARY CHLOROPHYLL REPORT"
1730 PRINT "A  ---  ANALYSIS OF ONE SAMPLE"
1740 PRINT "D  ---  DELETION OF DATA OF ONE SAMPLE"
1750 PRINT "E  ---  END OF CHLOROPHYLL ANALYSIS"
1760 PRINT "H  ---  HELP"
1770 REM ----------  CHLOROPHYLL ANALYSIS COMMAND SELECT
1780 ON ESC THEN GOTO 4130
1790 ESC
1800 ON ERR THEN GOTO 1900
1810 PRINT
1820 PRINT
1830 PRINT "CHLOROPHYLL ANALYSIS COMMANDS:  ";
1840 INPUT "R, A, D, E, H(CR)  >>> ",A$
1850 ON ERR THEN STOP
1860 IF LEN(A$)=0 THEN LET A$="H"
1870 ON ERR THEN STOP
1880 LET P=POS(C0$,A$,1)
1890 ON P THEN GOTO 1960, 2030, 3160, 4010, 1700
1900 ON ERR THEN STOP
1910 PRINT "<7>"
1920 PRINT "INVALID COMMAND."
1930 GOTO 1800
1940 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
1950 REM              CHLOROPHYLL SUMMARY REPORT SECTION
1960 NOESC
1970 CLOSE
1980 LET F3$="UVV0.C3"
1990 GOTO 4180
2000 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
2010 REM              CHLOROPHYLL SAMPLE ANALYSIS SECTION
2020 REM
2030 ON ESC THEN GOTO 3100
2040 LET D=0
2050 LET V=0
2060 LET B=0
2070 LET F0$="UVV0C.DS"
2080 IF I0$[1,1]="M" THEN GOTO 2190
2090 ON ERR THEN GOTO 2110
2100 DELETE F0$

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVV0.CO

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2110 ON ERR THEN STOP
2120 LET S0=0
2130 LET S1=1
2140 LET S2=0
2150 OPEN FILE[4,0],F0$,32
2160 WRITE FILE[4,0],S0,S1,S2
2170 CLOSE FILE[4]
2180 GOTO 2330
2190 OPEN FILE[4,0],F0$,32
2200 READ FILE[4,0],S0,S1,S2
2210 LET J=S1
2220 FOR I=(S1-1) TO 1 STEP -1
2230   READ FILE[4,I],M
2240   IF M<>1 THEN GOTO 2270
2250   LET J=I
2260   GOTO 2280
2270 NEXT I
2280 IF J=S1 THEN GOTO 2310
2290 READ FILE[4,J],M,P0,P1,S$,D
2300 READ FILE[4,J+1],M,V,X,Y,B
2310 CLOSE FILE[4]
2320 REM ----------  SET SAMPLE PARAMETERS
2330 ON ESC THEN GOTO 1780
2340 LET S$=""
2350 ON ERR THEN GOTO 2410
2360 PRINT
2370 PRINT "SAMPLE ID :  [USER-SET OR AUTOMATIC(CR)]";
2380 INPUT "  >>> ",S$
2390 ON ERR THEN STOP
2400 GOTO 2440
2410 ON ERR THEN STOP
2420 PRINT "<7>"
2430 GOTO 2350
2440 IF LEN(S$)>0 THEN GOTO 2530
2450 LET S$="S0000000"
2460 LET V$=STR$(SYS(2))
2470 LET S$[3-LEN(V$)+1,3]=V$
2480 LET V$=STR$(SYS(1))
2490 LET S$[5-LEN(V$)+1,5]=V$
2500 LET V$=STR$(S2+1)
2510 LET S$[8-LEN(V$)+1,8]=V$
2520 GOTO 2650

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2530 LET K=LEN(S$)
2540 FOR I=(K+1) TO 8
2550   LET S$[I,I]=" "
2560 NEXT I
2570 FOR I=8 TO 1 STEP -1
2580   LET J=K+I-8
2590   IF J>=1 THEN GOTO 2620
2600   LET S$[I,I]="0"
2610   GOTO 2640
2620   IF S$[J,J]=" " THEN LET S$[J,J]="0"
2630   LET S$[I,I]=S$[J,J]
2640 NEXT I
2650 LET F5=1
2660 PRINT
2670 PRINT "SAMPLE ID :  "; TAB(35);S$
2680 GOSUB 4280
2690 ON ESC THEN GOTO 1780
2700 ON F5 THEN GOTO 1780, 2730
2710 LET S$=N3$[1,8]
2720 GOTO 2530
2730 OPEN FILE[4,0],F0$,32
2740 READ FILE[4,0],S0,S1,S2
2750 LET J=1
2760 LET K=0
2770 FOR I=1 TO S0
2780   READ FILE[4,J],M,P0,P1,V$
2790   LET J=P1
2800   IF M=-1 THEN GOTO 2780
2810   IF V$=S$ THEN LET K=1
2820 NEXT I
2830 CLOSE FILE[4]
2840 IF K=0 THEN GOTO 2880
2850 PRINT "<7>"
2860 PRINT "SAMPLE ";S$;" ALREADY EXISTS."
2870 GOTO 2340
2880 LET F5=3
2890 PRINT "DILUTION FACTOR : "; TAB(34);D
2900 GOSUB 4280
2910 ON ESC THEN GOTO 1780
2920 ON F5 THEN GOTO 2880, 2950, 1780
2930 LET D=VAL(N3$)
2940 GOTO 2880

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2950 IF D>0 THEN GOTO 2980
2960 PRINT "<7>"
2970 GOTO 2880
2980 LET F0$="UVVOC.DS"
2990 OPEN FILE[4,0],F0$,32
3000 ON ESC THEN GOTO 3100
3010 READ FILE[4,0],S0,S1,S2
3020 LET M=1
3030 LET P0=0
3040 LET P1=S1+11
3050 WRITE FILE[4,S1],M,P0,P1,S$,D
3060 CLOSE FILE[4]
3070 NOESC
3080 LET F3$="UVVO.C5"
3090 GOTO 4180
3100 NOESC
3110 CLOSE FILE[4]
3120 GOTO 1780
3130 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
3140 REM                  SAMPLE (ONE) DELETION SECTION
3150 REM
3160 ON ESC THEN GOTO 1780
3170 ON ERR THEN GOTO 3270
3180 PRINT
3190 PRINT "SAMPLE DELETION:";
3200 PRINT "  LIST SAMPLES[1], DELETE BY ID[2],"
3210 PRINT  TAB(18);"DELETE BY LIST NUMBER[3], CONTINUE[4(CR)]";
3220 INPUT "  >>> ",A$
3230 ON ERR THEN STOP
3240 IF LEN(A$)=0 THEN LET A$="4"
3250 LET P=POS("1234",A$,1)
3260 ON P THEN GOTO 3320, 3490, 3760, 1780
3270 ON ERR THEN STOP
3280 PRINT "<7>"
3290 PRINT "PLEASE ENTER 1, 2, 3, OR 4."
3300 GOTO 3170
3310 REM ----------  LIST SAMPLES
3320 ON ESC THEN GOTO 3950
3330 LET F0$="UVVOC.DS"
3340 OPEN FILE[4,0],F0$,32
3350 READ FILE[4,0],S0,S1,S2
3360 PRINT

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
3370 LET P1=1
3380 FOR I=1 TO S0
3390   LET J=P1
3400   READ FILE[4,J],M,P0,P1,S$
3410   IF M<>1 THEN GOTO 3390
3420   LET K=I-INT((I-1)/3)*3-1
3430   PRINT  TAB(5+K*20);STR$(I);" -- ";S$;
3440   IF K=2 THEN PRINT
3450 NEXT I
3460 CLOSE FILE[4]
3470 GOTO 3160
3480 REM ----------  DELETE SAMPLE BY ID
3490 ON ESC THEN GOTO 3950
3500 ON ERR THEN GOTO 3700
3510 PRINT
3520 INPUT "      SAMPLE ID : ",V$
3530 ON ERR THEN STOP
3540 IF LEN(V$)<>8 THEN GOTO 3700
3550 LET F0$="UVV0C.DS"
3560 OPEN FILE[4,0],F0$,32
3570 READ FILE[4,0],S0,S1,S2
3580 LET P1=1
3590 LET L=0
3600 FOR I=1 TO S0
3610   LET J=P1
3620   READ FILE[4,J],M,P0,P1,S$
3630   IF M<>1 THEN GOTO 3610
3640   IF P=2 THEN IF V$=S$ THEN LET L=J
3650   IF P=3 THEN IF K=I THEN LET L=J
3660   IF L=J THEN GOTO 3680
3670 NEXT I
3680 IF L<>0 THEN GOTO 3870
3690 CLOSE FILE[4]
3700 ON ERR THEN STOP
3710 PRINT "<7>"
3720 IF P=2 THEN PRINT "      SAMPLE ";V$;" NOT FOUND."
3730 IF P=3 THEN PRINT "      SAMPLE LIST NUMBER NOT FOUND."
3740 GOTO 3160
3750 REM ----------  DELETE SAMPLE BY LIST NUMBER
3760 ON ESC THEN GOTO 3950
3770 ON ERR THEN GOTO 3830
3780 PRINT

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
3790 PRINT "      SAMPLE LIST NUMBER (1 TO ";STR$(S0);")";
3800 INPUT "  >>> ",K
3810 ON ERR THEN STOP
3820 IF K>0 THEN IF K<=S0 THEN IF K=INT(K) THEN GOTO 3550
3830 ON ERR THEN STOP
3840 PRINT "<7>"
3850 PRINT "INCORRECT LIST NUMBER."
3860 GOTO 3770
3870 WRITE FILE[4,L],(-M)
3880 LET S0=S0-1
3890 WRITE FILE[4,0],S0,S1,S2
3900 CLOSE FILE[4]
3910 PRINT
3920 PRINT "SAMPLE ";S$;" HAS BEEN DELETED."
3930 GOTO 1780
3940 REM  [ESC FROM SAMPLE DELETION]
3950 NOESC
3960 CLOSE
3970 GOTO 1780
3980 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
3990 REM              CHLOROPHYLL ANALYSIS ENDING SECTION
4000 REM
4010 ON ESC THEN GOTO 4090
4020 LET F0$="UVV0C.RP"
4030 OPEN FILE[3,0],F0$,21
4040 READ FILE[3,3],I0$
4050 LET I0$[1,1]="S"
4060 WRITE FILE[3,3],I0$
4070 CLOSE FILE[3]
4080 GOTO 4130
4090 NOESC
4100 CLOSE
4110 GOTO 1780
4120 REM ----------  EXIT TO MCL
4130 NOESC
4140 PRINT
4150 CLOSE
4160 LET F3$="UVV0.00"
4170 REM ----------  EXIT POINT
4180 LET F0$="UVV00.TR"
4190 OPEN FILE[0,0],F0$,21
4200 WRITE FILE[0,1],F1$

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
4210 WRITE FILE[0,2],F2$
4220 WRITE FILE[0,3],F3$
4230 CLOSE
4240 CHAIN F3$
4250 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
4260 REM                 RESPONSE-PROCESSING SUBROUTINE
4270 REM
4280 ON ESC THEN RETURN
4290 ON ERR THEN GOTO 4330
4300 INPUT "        [KEEP(CR) OR CHANGE]  >>> ",N3$
4310 ON ERR THEN STOP
4320 GOTO 4380
4330 ON ERR THEN STOP
4340 PRINT "<7>"
4350 PRINT "INVALID RESPONSE."
4360 PRINT  TAB(35);
4370 GOTO 4290
4380 ON F5 THEN GOTO 4420, 4450, 4530
4390 PRINT "<7>"
4400 PRINT "ERROR F5=";F5
4410 STOP
4420 LET F5=0
4430 IF LEN(N3$)=0 THEN LET F5=2
4440 RETURN
4450 ON (LEN(N3$)+1) THEN GOTO 4470, 4490
4460 GOTO 4640
4470 LET F5=3
4480 RETURN
4490 LET P=POS(I2$,N3$,1)
4500 IF P=0 THEN GOTO 4640
4510 LET F5=0
4520 RETURN
4530 IF LEN(N3$)>0 THEN GOTO 4560
4540 LET F5=2
4550 RETURN
4560 FOR I=1 TO LEN(N3$)
4570   IF POS(N4$,N3$[I,I],1)=0 THEN GOTO 4640
4580 NEXT I
4590 ON ERR THEN GOTO 4640
4600 IF VAL(N4$)=VAL(N4$) THEN GOTO 4610
4610 ON ERR THEN STOP
4620 LET F5=0

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
4630 RETURN
4640 LET F5=1
4650 PRINT "<7>"
4660 PRINT "INVALID RESPONSE."
4670 RETURN

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                   PAGE 13
                      SYMBOL TABLE FOR UVV0.CO

SYMBOL    REFERENCES
------  ------------------------------------------------------------

 0310  0200
 0360  0300
 0590  0530
 0690  0620  0790
 0770  0690
 0800  0640  0760  0870
 0880  0850  0930  0950
 0960  0930  1000  1020
 1030  1000  1090
 1100  1070  1140  1160  1180
 1170  1140
 1190  1240  1260
 1270  1240
 1280  1370  1390
 1400  1370
 1410  1460  1480
 1490  1460  1550
 1570  0740  0750  1530
 1700  1890
 1780  0600  0610  1650  1700  2330  2690  2700  2910  2920  3120
       3160  3260  3930  3970  4110
 1800  1930
 1900  1800
 1960  1890
 2030  1890
 2110  2090
 2190  2080
 2270  2240
 2280  2260
 2310  2280
 2330  2180
 2340  2870
 2350  2430
 2410  2350
 2440  2400
 2530  2440  2720
 2620  2590
 2640  2610
 2650  2520
 2730  2700
 2780  2800
 2880  2840  2920  2940  2970
 2950  2920
 2980  2950
 3100  2030  3000
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                   PAGE 14
                      SYMBOL TABLE FOR UVV0.CO

SYMBOL    REFERENCES
------  ------------------------------------------------------------

 3160  1890  3470  3740
 3170  3300
 3270  3170
 3320  3260
 3390  3410
 3490  3260
 3550  3820
 3610  3630
 3680  3660
 3700  3500  3540
 3760  3260
 3770  3860
 3830  3770
 3870  3680
 3950  3320  3490  3760
 4010  1890
 4090  4010
 4130  0480  0500  0840  0850  0920  0930  0990  1000  1060  1070
       1130  1140  1230  1240  1360  1370  1450  1460  1520  1530
       1780  4080
 4180  1990  3090
 4280  0830  0910  0980  1050  1120  1220  1350  1440  1510  2680
       2900
 4290  4370
 4330  4290
 4380  4320
 4420  4380
 4450  4380
 4470  4450
 4490  4450
 4530  4380
 4560  4530
 4610  4600
 4640  4460  4500  4570  4590
 A$    0230  0720  0740  0750  0760  1840  1860  1880  3220  3240
       3250
 B     2060  2300
 C0$   0230  0270  1880
 D     2040  2290  2890  2930  2950  3050
 E     0580  0970  1010  1630
 F0$   0240  0330  0360  0370  0510  0520  1570  1580  2070  2100
       2150  2190  2730  2980  2990  3330  3340  3550  3560  4020
       4030  4180  4190
 F1$   0240  0330  0380  0450  0600  4200
 F2$   0240  0330  0390  0450  0460  4210
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                       PAGE 15
                  SYMBOL TABLE FOR UVV0.CO

SYMBOL    REFERENCES
------   ------------------------------------------------------------
 F3$     0240  0330  0400  0460  0470  1980  3080  4160  4220  4240
 F4      0190  0340  0480
 F5      0800  0850  0880  0930  0960  1000  1030  1070  1100  1140
         1190  1240  1280  1370  1410  1460  1490  1530  2650  2700
         2880  2920  4380  4400  4420  4430  4470  4510  4540  4620
         4640
 FL#0    0370  0380  0390  0400  0410  0420  0430  4190  4200  4210
         4220
 FL#3    0520  0540  0550  0560  0570  0580  0590  1580  1590  1600
         1610  1620  1630  1640  4030  4040  4060  4070
 FL#4    2150  2160  2170  2190  2200  2230  2290  2300  2310  2730
         2740  2780  2830  2990  3010  3050  3060  3110  3340  3350
         3400  3460  3560  3570  3620  3690  3870  3890  3900
 I       1270  1290  1310  1320  1330  1340  1380  1400  2220  2230
         2250  2270  2540  2550  2560  2570  2580  2600  2630  2640
         2770  2820  3380  3420  3430  3450  3600  3650  3670  4560
         4570  4580
 I0$     0260  0570  0610  0620  0630  0900  0940  1210  1250  1340
         1380  1430  1470  1620  2080  4040  4050  4060
 I1$     0260  0290  0890  1200  1300  1420
 I2$     0260  0890  1200  1300  1420  4490
 J       1290  1300  2210  2250  2280  2290  2300  2580  2590  2620
         2630  2750  2780  2790  3390  3400  3610  3620  3640  3650
         3660
 K       2530  2540  2580  2760  2810  2840  3420  3430  3440  3650
         3800  3820
 L       3590  3640  3650  3660  3680  3870
 L0      0580  1110  1150  1170  1180  1630
 M       2230  2240  2290  2300  2780  2800  3020  3050  3400  3410
         3620  3630  3870
 N1$     0250  0410
 N2$     0250  0420
 N3$     0250  0860  0940  1010  1080  1150  1250  1380  1470  1540
         2710  2930  4300  4430  4450  4490  4530  4560  4570
 N4$     0250  0280  4570  4600
 P       1880  1890  3250  3260  3640  3650  3720  3730  4490  4500
 P0      2290  2780  3030  3050  3400  3620
 P1      2290  2780  2790  3040  3050  3370  3390  3400  3580  3610
         3620
 R1$     0260  0540  0820  0860  1590
 R2$     0260  0550  1040  1080  1600
 R3$     0260  0560  1500  1540  1610
 S$      0230  2290  2340  2380  2440  2450  2470  2490  2510  2530
         2550  2600  2620  2630  2670  2710  2810  2860  3050  3400
         3430  3620  3640  3920
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                       PAGE 16
                  SYMBOL TABLE FOR UVV0.CO

SYMBOL    REFERENCES
------   ------------------------------------------------------------
 S0      2120  2160  2200  2740  2770  3010  3350  3380  3570  3600
         3790  3820  3880  3890
 S1      2130  2160  2200  2210  2220  2280  2740  3010  3040  3050
         3350  3570  3890
 S2      2140  2160  2200  2500  2740  3010  3350  3570  3890
 V       2050  2300
 V$      0230  2460  2470  2480  2490  2500  2510  2780  2810  3520
         3540  3640  3720
 X       2300
 Y       2300
```

AUTOMATED CHLOROPHYLL SAMPLE ANALYSIS MODULE -- UVVO.C2

UVVO.C2 is chained to from UVVO.C1 or UVVO.C4. Certain necessary parameters are retrieved from the following files: UVVOO.TR; UVVOO.CF; UVVOC.CF; UVVOC.RP; and UVVOC.DS. After the commands are offered, the analyst chooses the desired command.

The scan command is processed only when fewer than five replicates of a sample have been analyzed. Replicate parameters are presented to the user for approval or change. One parameter is the sample volume/area. (Note that its units differ between volume and area, and that this difference may induce a change in the 'F' constant by a factor of one thousand.) If the biomass flag indicates that biomass is being measured, then this parameter's value also is offered for change or approval.

The scan procedure continues with a scan of the unacidified sample. (See the section of the Data Acquisition/Reduction subroutine for more details.) When the scan has been completed, the A/D counts at nanometer increments are converted to absorbance units. (A ceiling of two absorbance units has been set.) These data are smoothed, and the absorbances at the appropriate wavelengths are ascertained. The peak flag may effect a search for the highest absorbance, as opposed to the act of taking the absorbance at the method wavelength.

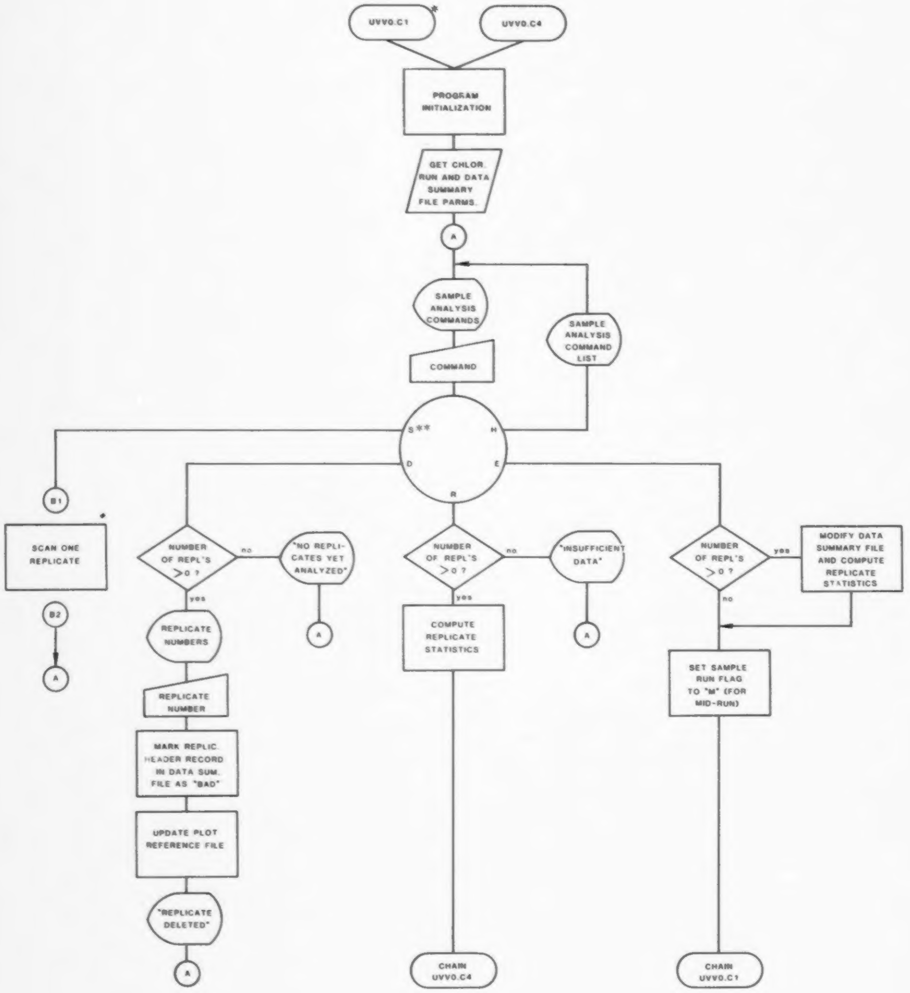
Results are then computed and displayed. Should they be approved, the plot data are stored in the file UVVOC.PF, and the plot data file pointer is updated. If the acidification flag indicates that acidified scans are to be made, then the procedure for scanning, data reduction, and results approval is followed for the acidified sample. Once the replicate has been dealt with (and accepted), a plot reference file block is appended for the replicate scan or scans.

The replicate deletion is permitted only for the sample being analyzed and only if one or more replicates have been scanned. The replicate number is received, and a search is made for the corresponding replicate header record in the data summary file. The sign of the value of this record's marker is reversed to indicate data deletion. Also, the plot reference is opened. The block of the deleted replicate is found, and the second major heading is edited to read "REPLICATE NUMBER X". Replicate numbers in the second major headings of following undeleted replicates are each decremented by one. The completed operation is noted at the terminal.

The command for an intermediate sample report is honored, provided one or more replicates have been scanned. A subroutine computes means and standard deviations of replicate results, and stores them in the data summary file. The module chains to the "destination" program UVVO.C4 through the program exit point.

Several key operations comprise the sample analysis ending section. If one or more replicates have been studied, then replicate statistics are computed and stored in the data summary file. The sample counter, sample pointer, and sample numbering counter are each appropriately incremented and written to the data summary file. The sample-run flag is set for "mid-run" and written to the chlorophyll run-parameters file. The "destination" program is defined as UVVO.C1, and the module flow drops to the exit point.

At the program exit point, the module writes the modified program location variables to the system status transfer file, and then chains to the "destination" program.


UVV0.C1
*
UVV0.C4
PROGRAM INITIALIZATION
GET CHLOR. RUN AND DATA SUMMARY FILE PARMS.
A
SAMPLE ANALYSIS COMMANDS
SAMPLE ANALYSIS COMMAND LIST
COMMAND
S**
H
D
E
R
B1
•
SCAN ONE REPLICATE
B2
A
NUMBER OF REPL'S >0 ?
no
"NO REPLICATES YET ANALYZED"
A
yes
REPLICATE NUMBERS
REPLICATE NUMBER
MARK REPLIC. HEADER RECORD IN DATA SUM. FILE AS "BAD"
UPDATE PLOT REFERENCE FILE
"REPLICATE DELETED"
A
NUMBER OF REPL'S >0 ?
no
"INSUFFICIENT DATA"
A
yes
COMPUTE REPLICATE STATISTICS
CHAIN UVV0.C4
NUMBER OF REPL'S >0 ?
yes
MODIFY DATA SUMMARY FILE AND COMPUTE REPLICATE STATISTICS
no
SET SAMPLE RUN FLAG TO "M" (FOR MID-RUN)
CHAIN UVV0.C1

* In manual run (UVV0.C5), this chaining program is UVV0.C0.

** In manual run (UVV0.C5), this command is an "I".

• In manual run (UVV0.C5), this section is for input of data of one replicate (see figure 12).

Figure 10. Flowchart of modules UVV0.C2 and UVV0.C5.

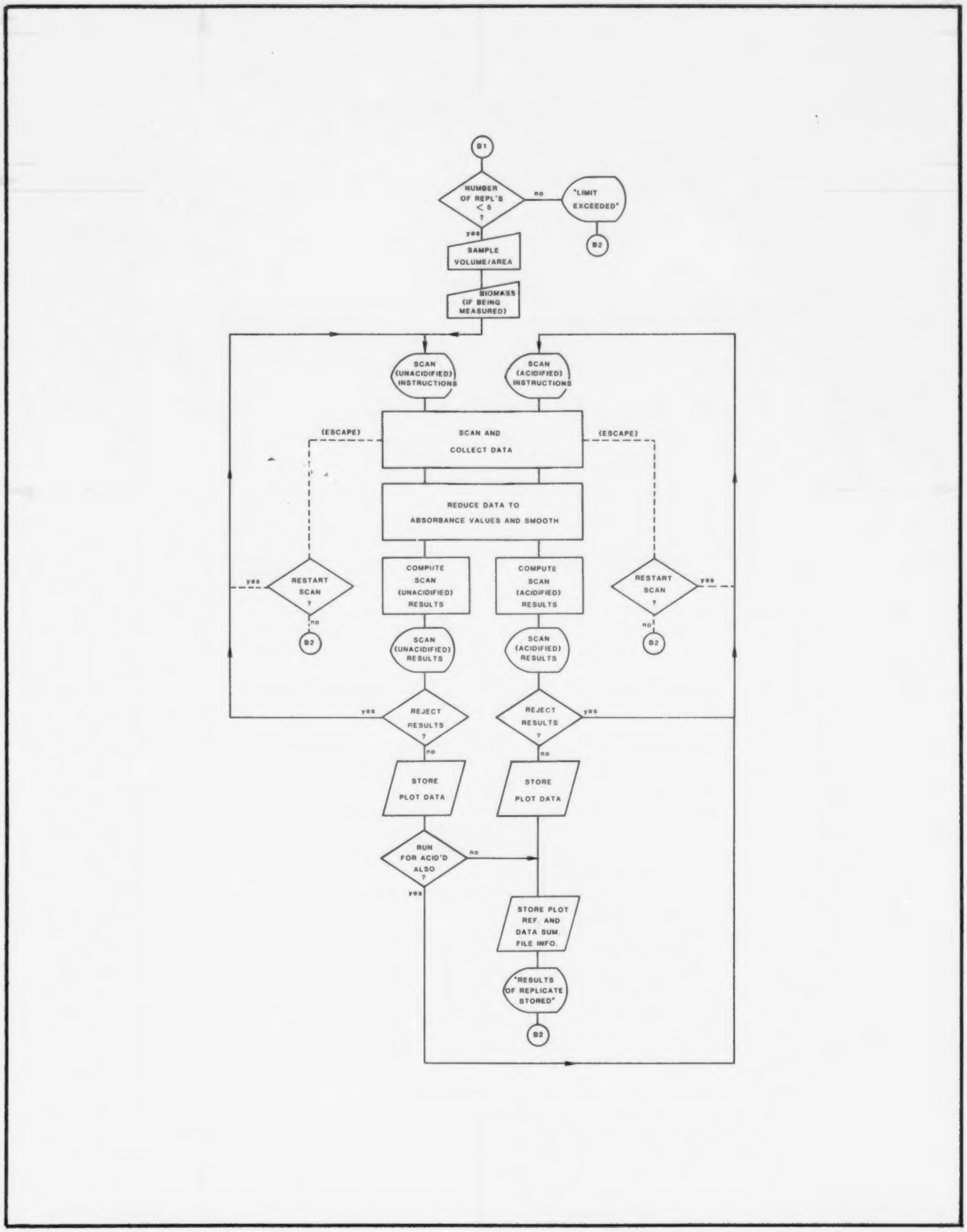

B1
NUMBER OF REPL'S < 5 ?
no
"LIMIT EXCEEDED"
B2
yes
SAMPLE VOLUME/AREA
BIOMASS (IF BEING MEASURED)
SCAN (UNACIDIFIED) INSTRUCTIONS
SCAN (ACIDIFIED) INSTRUCTIONS
(ESCAPE)
SCAN AND COLLECT DATA
(ESCAPE)
REDUCE DATA TO ABSORBANCE VALUES AND SMOOTH
yes
RESTART SCAN ?
no
B2
COMPUTE SCAN (UNACIDIFIED) RESULTS
COMPUTE SCAN (ACIDIFIED) RESULTS
RESTART SCAN ?
yes
no
B2
SCAN (UNACIDIFIED) RESULTS
SCAN (ACIDIFIED) RESULTS
yes
REJECT RESULTS ?
REJECT RESULTS ?
yes
no
no
STORE PLOT DATA
STORE PLOT DATA
RUN FOR ACID'D ALSO ?
no
yes
STORE PLOT REF. AND DATA SUM. FILE INFO.
"RESULTS OF REPLICATE STORED"
B2

Figure 11. Flowchart of the scan function of module UVVO.C2.

TABLE 17. VARIABLE DESCRIPTIONS FOR MODULES UVVO.C2 and UVVO.C5

A$	a single-character user-response variable
A2*	an accumulator used by CALL 257
A6*	the averaged A/D count from CALL 6
B	the biomass of a replicate
B0*	the number of blocks in the plot reference file
C0*	the number of signal values taken from the end of one scan array and placed at the beginning of the next
C1$	the sample analysis command line
C2*	the CALL 257 indicator number for scan-clear (for stop)
C5*	the transmittance signal channel number
C6*	the wavelength signal channel number
C7*	the CALL 7 channel-indicator number
D	the dilution factor of the sample
D7*	the CALL 7 initial time delay (in sixtieth seconds)
D8*	the CALL 7 between-signal pairs time delay (in sixtieth seconds)
E	the extract volume of the chlorophyll run
F	the constant used in the trichromatic and monochromatic equations
F0$	a file name variable
F1$, F2$, F3$	program location variables; see Table 1
F4	a flag used during program initialization
F5	a flag used by the response-processing, peak absorbance search, plot file-stuff, and compute-statistics subroutines, where:

- in response-processing subroutine:

Before subroutine	After subroutine
F5=3	F5 = 3 for escape during subroutine
	F5 = 0 for new input (change)
	F5 = 1 for improper input
	F5 = 2 for no input (accept)

- in peak absorbance search subroutine and in plot file-stuff subroutine:

Before subroutine	After subroutine
F5 = 0	F5 = 0 for escape during subroutine
	F5 = 1 for completed subroutine function

TABLE 17. (Continued)

	• in compute-statistics subroutine: Before subroutine: F5 = 0 After subroutine: F5 = 1 for escape during subroutine F5 = 0 for completed subroutine function
F6	a flag used by the Data Acquisition/Reduction (DAR) subroutine (in UVVO.C2 only), and as a branching flag in the compute-statistics subroutine; in the DAR subroutine: Before subroutine: F6 = 0 After subroutine: F6 = 1 for completed subroutine function F6 = 2 for escape during scan; restart scan F6 = 3 for escape during scan; do not restart scan
H()	primarily concentration results, where: H(1) chlorophyll *a* (in mg/m^3 or mg/m^2) H(2) chlorophyll *b* (" " " ") H(3) chlorophyll *c* (" " " ") H(4) total chlorophyll (" " ") H(5) ratio of peak absorbances (uncorrected to corrected) H(6) chlorophyll *a*' (corrected) (in mg/m^3 or mg/m^2) H(7) pheophytin *a* (" " " ") H(8) total chlorophyll (corrected) (" " ")
I	a loop-counter and general-purpose variable
IO*	the number of signal pairs (less one) acquired in a scan
IO$	the character string of user-chosen run-parameter flags
J	a loop-counter and general-purpose variable
J1*, J2*	scan array pointers used in the DAR subroutine
K	a loop-counter and general-purpose variable
KO*	the highest wavelength of the spectrophotometer or the VO scan array prior to scanning
K1*	the limit above which KO must be before a scan may begin
L	a loop-counter and general-purpose variable
LO	the cell path length for the chlorophyll run
L$	an output and output-format character string
M	the marker (first item) of each record in the data summary file; see Table 16
NO*	the total number of values to fill the VO scan array
N1$, N2$	the analyst's and instrument's names
N3$	the input character string of the response-processing subroutine
N4$	a character string composed of valid numeric characters
N6*	the number of A/D counts to be acquired and averaged in a CALL 6
N7*	the actual number of counts to be put in the VO scan array

TABLE 17. (Continued)

O()		the raw data values for a replicate, where:
	O(1)	the unacidified lowest wavelength absorbance
	O(2)	the unacidified middle wavelength absorbance
	O(3)	the unacidified peak absorbance (method or found)
	O(4)	the unacidified turbidity absorbance (at 750 nm.)
	O(5)	the acidified peak absorbance (method or found)
	O(6)	the acidified turbidity absorbance (at 750 nm.)
P		a branching variable
P0		the replicate counter (number of replicates of a sample)
P1		the replicate pointer (to next repl. header record in UVVOC.DS)
P2*		the plot file pointer (to next available plot file record)
P()		a matrix used for computation of replicate statistics
Q1*,Q2*,Q3*		the constants of the wavelength calibration equation
R*		the scan speed (in nanometers per minute)
R1$, R2$, R3$		chlorophyll run-parameter strings
	R1$	the station or study
	R2$	the extraction method
	R3$	a comment for the run
R()		ratio results, where:
	R(1)	ratio of chlorophyll *a* (uncorrected) to chlorophyll *b*
	R(2)	ratio of chlorophyll *a* to chlorophyll *c*
	R(3)	ratio of chlorophyll *a*' (corrected) to chlorophyll *b*
	R(4)	ratio of chlorophyll *a*' to chlorophyll *c*
S$		the sample identifier
S0		the sample counter (number of samples analyzed)
S1		the sample pointer (to next sample header record in UVVOC.DS)
S2		the sample numbering counter (kept and deleted samples)
U()		autotrophic indeces: U(1) -- uncorrected; U(2) -- corrected
V		the sample volume/area of a replicate
V$		a general-purpose character string
V0()*		the CALL 7 scan (data storage) array
W, X, Y		general-purpose variables usually representing wavelength
W0*,W1*		the lower and upper scan range wavelength bounds
X0*,W1*		the lower and upper wavelength bounds evaluated after a scan portion
Z()*		the array in which evaluated A/D counts at nanometer increments are stored and subsequently converted to absorbance values and smoothed

* Starred variables are used in UVVO.C2 only.

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                       PAGE  1
                        PROGRAM LISTING FOR UVV0.C2

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0010 REM           ++++++++++++++++++++++++++++++++++++++++
0020 REM           +    AUTOMATED  ULTRAVIOLET-VISIBLE    +
0030 REM           +       SPECTROPHOTOMETER SYSTEM       +
0040 REM           +     AUTOMATED CHLOROPHYLL SAMPLE     +
0050 REM           +       ANALYSIS MODULE: UVV0.C2       +
0060 REM           +    WRITTEN BY GREG ROTH (4/11/80)    +
0070 REM           +    UNIV. OF CINCI. COMPUTER CENTER   +
0080 REM           +    (UVV0.C2 IS SUB-MODULE OF AUTO-   +
0090 REM           +    MATED CHLOROPHYLL MOD. UVV0.C1)   +
0100 REM           ++++++++++++++++++++++++++++++++++++++++
0110 REM
0120 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0130 REM                    PROGRAM INITIALIZATION
0140 REM
0150 REM ----------  SET PAGE/ESC/ROUTE-FLAG
0160 PAGE =72
0170 ON ESC THEN GOTO 0370
0180 LET F4=0
0190 ESC
0200 REM ----------  DIM/INIT STRING VARS. AND ARRAYS
0210 DIM C1$[5],S$[8],A$[1]
0220 DIM F0$[13],F1$[13],F2$[13],F3$[13]
0230 DIM N1$[20],N2$[20],N3$[12],N4$[12]
0240 DIM R1$[18],R2$[18],R3$[20],I0$[6]
0250 DIM L$[72],V$[16]
0260 LET C1$="SDREH"
0270 LET N4$="0123456789-."
0280 DIM O[6],H[8],R[4],U[2],P[10,7]
0290 REM   [DIM/INIT SCAN VARS.]
0300 LET D7=0
0310 LET D8=0
0320 LET N6=5
0330 LET A6=0
0340 LET I0=79
0350 DIM V0[(I0+1)*2]
0360 GOTO 0430
0370 NOESC
0380 CLOSE
0390 DIM F0$[13],F1$[13],F2$[13],F3$[13]
0400 LET F4=1
0410 REM
0420 REM ----------  RETRIEVE SYSTEM STATUS PARMS.

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                       PAGE  2
                        PROGRAM LISTING FOR UVV0.C2

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0430 LET F0$="UVV00.TR"
0440 OPEN FILE[0,0],F0$,21
0450 READ FILE[0,1],F1$
0460 READ FILE[0,2],F2$
0470 READ FILE[0,3],F3$
0480 READ FILE[0,4],N1$
0490 READ FILE[0,5],N2$
0500 READ FILE[0,6],C5,C6,C7
0510 CLOSE FILE[0]
0520 REM   [MODIFY PROGRAM LOCATION VARS.]
0530 LET F1$=F2$
0540 LET F2$=F3$
0550 LET F3$=F1$
0560 IF F4=1 THEN GOTO 6560
0570 REM ----------  RETRIEVE WAVELENGTH CALIBRATION PARMS.
0580 ON ESC THEN GOTO 6560
0590 LET F0$="UVV00.CF"
0600 OPEN FILE[1,0],F0$,20
0610 READ FILE[1,1],Q1,Q2,Q3
0620 CLOSE FILE[1]
0630 REM ----------  RETRIEVE TRANSMITTANCE CALIBRATION PARMS.
0640 LET F0$="UVV0C.CF"
0650 OPEN FILE[2,0],F0$,8
0660 READ FILE[2,1],X,R
0670 READ FILE[2,2],W1,W0
0680 CLOSE FILE[2]
0690 REM   [DIM/INIT REMAINING SCAN VARS.]
0700 LET D8=3600/R
0710 DIM Z[W1-W0+1]
0720 REM ----------  RETRIEVE CHLOROPHYLL RUN PARMS.
0730 LET F0$="UVV0C.RP"
0740 OPEN FILE[3,0],F0$,21
0750 READ FILE[3,0],R1$
0760 READ FILE[3,1],R2$
0770 READ FILE[3,2],R3$
0780 READ FILE[3,3],I0$
0790 READ FILE[3,4],E,L0
0800 CLOSE FILE[3]
0810 REM ----------  RETRIEVE BASIC DATA SUMMARY INFO.
0820 LET F0$="UVV0C.DS"
0830 OPEN FILE[4,0],F0$,32
0840 READ FILE[4,0],S0,S1,S2

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE  3
                    PROGRAM LISTING FOR UVV0.C2

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0850 READ FILE[4,S1],M,P0,P1,S$
0860 CLOSE FILE[4]
0870 GOTO 1000
0880 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0890 REM                   SAMPLE ANALYSIS COMMAND LEVEL
0900 REM
0910 REM ----------  SAMPLE ANALYSIS COMMAND LIST
0920 ON ESC THEN GOTO 1000
0930 PRINT
0940 PRINT "S  ---  SCAN OF ONE REPLICATE"
0950 PRINT "D  ---  DELETION OF ONE REPLICATE"
0960 PRINT "R  ---  INTERMEDIATE SAMPLE REPORT"
0970 PRINT "E  ---  END OF ANALYSIS OF THIS SAMPLE"
0980 PRINT "H  ---  HELP"
0990 REM ----------  SAMPLE ANALYSIS COMMAND SELECT
1000 ON ESC THEN GOTO 6260
1010 ESC
1020 ON ERR THEN GOTO 1100
1030 PRINT
1040 PRINT "SAMPLE ANALYSIS COMMANDS:  ";
1050 INPUT "S, D, R, E, H(CR)  >>> ",A$
1060 ON ERR THEN STOP
1070 IF LEN(A$)=0 THEN LET A$="H"
1080 LET P=POS(C1$,A$,1)
1090 ON P THEN GOTO 1170, 5410, 6060, 6260, 0920
1100 ON ERR THEN STOP
1110 PRINT "<7>"
1120 PRINT "INVALID COMMAND."
1130 GOTO 1020
1140 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
1150 REM                         SAMPLE SCAN SECTION
1160 REM
1170 ON ESC THEN GOTO 3870
1180 LET F0$="UVVOC.DS"
1190 OPEN FILE[4,0],F0$,32
1200 READ FILE[4,0],S0,S1,S2
1210 READ FILE[4,S1],M,P0,P1,S$,D
1220 IF P0>0 THEN LET I=P1-4
1230 IF P0=0 THEN LET I=S1-1
1240 LET M=0
1250 LET V=0
1260 LET B=0

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE  4
                    PROGRAM LISTING FOR UVV0.C2

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
1270 FOR I=I TO 12 STEP -1
1280   READ FILE[4,I],M
1290   IF M=2 THEN GOTO 1310
1300 NEXT I
1310 IF M=2 THEN READ FILE[4,I],M,V,B
1320 CLOSE FILE[4]
1330 IF P0<5 THEN GOTO 1380
1340 PRINT "<7>"
1350 PRINT "MAY NOT EXCEED LIMIT OF 5 REPLICATES."
1360 GOTO 1000
1370 REM ----------  GET REPLICATE PARMS.
1380 LET V$="VOLUME (LITERS)"
1390 IF I0$[2,2]="E" THEN LET V$="AREA (M^2)"
1400 PRINT
1410 LET F5=3
1420 PRINT "SAMPLE ";V$;" : ";V;
1430 GOSUB 6680
1440 ON ESC THEN GOTO 3870
1450 ON F5 THEN GOTO 1410, 1480, 3870
1460 LET V=VAL(N3$)
1470 GOTO 1410
1480 IF V>0 THEN GOTO 1510
1490 PRINT "<7>";
1500 GOTO 1410
1510 IF I0$[5,5]="I" THEN GOTO 1650
1520 LET V$="MG/L"
1530 IF I0$[2,2]="E" THEN LET V$="G/M^2"
1540 LET F5=3
1550 PRINT "BIOMASS (";V$;") : ";B;
1560 GOSUB 6680
1570 ON ESC THEN GOTO 3870
1580 ON F5 THEN GOTO 1540, 1610, 3870
1590 LET B=VAL(N3$)
1600 GOTO 1540
1610 IF B>0 THEN GOTO 1650
1620 PRINT "<7>";
1630 GOTO 1540
1640 REM ----------  SCAN REPLICATE
1650 LET P2=1
1660 LET F0$="UVVOC.PF"
1670 ON ERR THEN GOTO 1690
1680 RENAME F0$,F0$

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE  5
                     PROGRAM LISTING FOR UVVO.C2

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
1690 ON ERR THEN STOP
1700 IF SYS(7)=-48 THEN DELAY =1
1710 IF SYS(7)=-48 THEN GOTO 1670
1720 OPEN FILE[5,0],F0$,4
1730 READ FILE[5,0],P2
1740 WRITE FILE[5,0],P2
1750 CLOSE FILE[5]
1760 PRINT
1770 PRINT "SCAN REPLICATE";(P0+1)
1780 LET V$="UNACID"
1790 PRINT
1800 PRINT "FOR ";V$;"IFIED SCAN:  ";
1810 ON ERR THEN GOTO 1860
1820 PRINT "SET AT";(W1+5);"NM., SET FOR SCAN AND ";
1830 INPUT "PRESS CR KEY. ",A$
1840 ON ERR THEN STOP
1850 IF LEN(A$)=0 THEN GOTO 1890
1860 ON ERR THEN STOP
1870 PRINT  TAB(17+LEN(V$));"<7>";
1880 GOTO 1810
1890 LET F6=0
1900 GOSUB 4240
1910 ON ESC THEN GOTO 3870
1920 ESC
1930 ON F6 THEN GOTO 1970, 1790, 3870
1940 PRINT "<7>"
1950 PRINT "ABNORMAL SCAN INTERRUPT."
1960 GOTO 1000
1970 LET F0$="UVVOC.CF"
1980 OPEN FILE[2,0],F0$,8
1990 FOR I=W1 TO W0 STEP -1
2000   READ FILE[2,(W1-I+3)],X,Y
2010   LET W=Z[W1-I+1]-X
2020   IF W>0 THEN LET Z[W1-I+1]=-LOG(W/(Y-X))/LOG(10)
2030   IF W<=0 THEN LET Z[W1-I+1]=2
2040 NEXT I
2050 CLOSE FILE[2]
2060 REM   [SMOOTH THE DATA]
2070 LET X=Z[1]
2080 LET W=Z[2]
2090 FOR I=3 TO (W1-W0-1)
2100   LET Y=X

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE  6
                     PROGRAM LISTING FOR UVVO.C2

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2110   LET X=W
2120   LET W=-3*(Z[I-2]+Z[I+2])
2130   LET W=W+12*(Z[I-1]+Z[I+1])
2140   LET W=W+17*Z[I]
2150   LET W=W/35
2160   LET Z[I-2]=Y
2170 NEXT I
2180 LET Z[W1-W0-2]=X
2190 LET Z[W1-W0-1]=W
2200 IF V$="ACID" THEN GOTO 2930
2210 REM   [COMPUTE UNACIDIFIED SCAN RESULTS]
2220 MAT O=ZER
2230 LET O[1]=Z[W1-630+1]
2240 LET W=645
2250 IF I0$[6,6]="J" THEN LET W=647
2260 LET O[2]=Z[W1-W+1]
2270 IF I0$[4,4]="M" THEN GOTO 2330
2280 LET F5=0
2290 GOSUB 3920
2300 ON ESC THEN GOTO 3870
2310 IF F5=0 THEN GOTO 3870
2320 GOTO 2360
2330 LET W=663
2340 IF I0$[6,6]="S" THEN LET W=665
2350 IF I0$[6,6]="J" THEN LET W=664
2360 LET O[3]=Z[W1-W+1]
2370 LET O[4]=Z[W1-750+1]
2380 LET F=(E*D)/(V*L0)
2390 IF I0$[2,2]="E" THEN LET F=F/1000
2400 LET W=O[3]-O[4]
2410 LET X=O[2]-O[4]
2420 LET Y=O[1]-O[4]
2430 LET P=POS("USJ",I0$[6,6],1)
2440 ON P THEN GOTO 2470, 2510, 2550
2450 PRINT "<7>ERROR; 'P' BRANCH-POINT."
2460 STOP
2470 LET H[1]=F*(11.64*W-2.16*X+.1*Y)
2480 LET H[2]=F*(-3.94*W+20.97*X-3.66*Y)
2490 LET H[3]=F*(-5.53*W-14.81*X+54.22*Y)
2500 GOTO 2580
2510 LET H[1]=F*(11.6*W-1.31*X-.14*Y)
2520 LET H[2]=F*(-4.34*W+20.7*X-4.42*Y)

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-´-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE  7
                     PROGRAM LISTING FOR UVV0.C2

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2530 LET H[3]=F*(-4.64*W-16.3*X+55*Y)
2540 GOTO 2580
2550 LET H[1]=F*(11.85*W-1.54*X-8E-02*Y)
2560 LET H[2]=F*(-5.43*W+21.03*X-2.66*Y)
2570 LET H[3]=F*(-1.67*W-7.6*X+24.52*Y)
2580 LET H[4]=H[1]+H[2]+H[3]
2590 LET R[1]=H[1]/H[2]
2600 LET R[2]=H[1]/H[3]
2610 LET U[1]=B*1000/H[1]
2620 PRINT
2630 LET V$="MG/M^3"
2640 IF IO$[2,2]="E" THEN LET V$[6,6]="2"
2650 LET L$="   (IN ",V$,")  CHL A: ----#.###    "
2660 LET L$=L$,"CHL B: ----#.###   CHL C: ----#.###"
2670 PRINT USING L$,H[1],H[2],H[3]
2680 LET L$="   TOTAL CHL: ------#.### ",V$
2690 LET L$=L$,"   CHL RATIOS   A/B:--#.##  A/C:--#.##"
2700 PRINT USING L$,H[4],R[1],R[2]
2710 LET L$="   AUTOTROPHIC INDEX: ----#.####"
2720 IF IO$[5,5]="K" THEN PRINT USING L$,U[1]
2730 ON ERR THEN GOTO 2800
2740 PRINT
2750 INPUT "REJECT UNACIDIFIED SCAN RESULTS ?  [N(CR) OR Y]  >>> ",A$
2760 ON ERR THEN STOP
2770 IF LEN(A$)=0 THEN GOTO 2830
2780 IF A$="N" THEN GOTO 2830
2790 IF A$="Y" THEN GOTO 1780
2800 ON ERR THEN STOP
2810 PRINT "<7>"
2820 GOTO 2730
2830 IF IO$[3,3]="N" THEN GOTO 3330
2840 LET F5=0
2850 GOSUB 4020
2860 ON ESC THEN GOTO 3870
2870 ESC
2880 IF F5=0 THEN GOTO 3870
2890 LET V$="ACID"
2900 LET P2=P2+(W1-W0+1)
2910 GOTO 1790
2920 REM   [COMPUTE ACIDIFIED SCAN RESULTS]
2930 IF IO$[4,4]="M" THEN GOTO 2990
2940 LET F5=0

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-´-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE  8
                     PROGRAM LISTING FOR UVV0.C2

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2950 GOSUB 3920
2960 ON ESC THEN GOTO 3870
2970 IF F5=0 THEN GOTO 3870
2980 GOTO 3000
2990 LET W=665
3000 LET O[5]=Z[W1-W+1]
3010 LET O[6]=Z[W1-750+1]
3020 LET X=O[5]-O[6]
3030 LET Y=O[3]-O[4]
3040 LET H[5]=Y/X
3050 LET H[6]=F*26.73*(Y-X)
3060 LET H[7]=F*26.73*(1.7*X-Y)
3070 LET H[8]=H[6]+H[2]+H[3]
3080 LET R[3]=H[6]/H[2]
3090 LET R[4]=H[6]/H[3]
3100 LET U[2]=B*1000/H[6]
3110 PRINT
3120 LET V$="MG/M^3"
3130 IF IO$[2,2]="E" THEN LET V$[6,6]="2"
3140 LET L$="   IN ",V$,",  CHL A´:----#.###"
3150 LET L$=L$,"  PHEO A:----#.###  TOTAL CHL:------#.###"
3160 PRINT USING L$,H[6],H[7],H[8]
3170 LET L$="   RATIOS,  ABS(UNACID/ACID): ---#.##  "
3180 LET L$=L$," CHLS  A´/B:--#.##  A´/C:--#.##"
3190 PRINT USING L$,H[5],R[3],R[4]
3200 LET L$="   AUTOTROPHIC INDEX: ----#.####"
3210 IF IO$[5,5]="K" THEN PRINT USING L$,U[2]
3220 LET V$="ACID"
3230 ON ERR THEN GOTO 3300
3240 PRINT
3250 INPUT "REJECT ACIDIFIED SCAN RESULTS ?  [N(CR) OR Y]  >>> ",A$
3260 ON ERR THEN STOP
3270 IF LEN(A$)=0 THEN GOTO 3330
3280 IF A$="N" THEN GOTO 3330
3290 IF A$="Y" THEN GOTO 1790
3300 ON ERR THEN STOP
3310 PRINT "<7>"
3320 GOTO 3230
3330 LET F5=0
3340 GOSUB 4020
3350 ON ESC THEN GOTO 3870
3360 ESC

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                      PAGE  9
                    PROGRAM LISTING FOR UVV0.C2

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
3370 IF F5=0 THEN GOTO 3870
3380 LET F0$="UVVOC.PR"
3390 ON ERR THEN GOTO 3410
3400 RENAME F0$,F0$
3410 ON ERR THEN STOP
3420 IF SYS(7)=-48 THEN DELAY =1
3430 IF SYS(7)=-48 THEN GOTO 3390
3440 OPEN FILE[6,0],F0$,41
3450 READ FILE[6,0],B0
3460 LET B0=B0+1
3470 WRITE FILE[6,0],B0,SYS(2),SYS(1),SYS(3)
3480 LET K=(B0-1)*5
3490 IF I0$[2,2]="P" THEN LET L$="PLANKTON"
3500 IF I0$[2,2]="E" THEN LET L$="PERIPHYTON"
3510 LET I=2
3520 IF I0$[3,3]="N" THEN LET I=1
3530 LET J=P2-(W1-W0+1)*(I-1)
3540 LET L=J+(W1-W0+1)
3550 WRITE FILE[6,K+2],L$,W0,W1,I,J,L
3560 LET L$="IDENTIFIER: ",S$
3570 WRITE FILE[6,K+3],L$
3580 LET L$="COMMENT: ",R3$
3590 WRITE FILE[6,K+4],L$
3600 LET L$="REPLICATE NUMBER ",STR$(P0+1)
3610 WRITE FILE[6,K+5],L$
3620 LET L$="NOTE: ACIDIFIED IS DASHED LINE"
3630 WRITE FILE[6,K+6],L$
3640 CLOSE FILE[6]
3650 LET F0$="UVVOC.DS"
3660 OPEN FILE[4,0],F0$,32
3670 READ FILE[4,0],S0,S1,S2
3680 READ FILE[4,S1],M,P0,P1,S$,D
3690 LET M=2
3700 WRITE FILE[4,P1],M,V,B
3710 LET M=0
3720 WRITE FILE[4,P1+1],M,O[1],O[2],O[3],O[4],O[5],O[6]
3730 WRITE FILE[4,P1+2],M,H[1],H[2],H[3],H[4],R[1],R[2],U[1]
3740 WRITE FILE[4,P1+3],M,H[5],H[6],H[7],H[8],R[3],R[4],U[2]
3750 LET P0=P0+1
3760 LET P1=P1+4
3770 LET M=1
3780 WRITE FILE[4,S1],M,P0,P1,S$,D

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                      PAGE 10
                    PROGRAM LISTING FOR UVV0.C2

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
3790 LET X=0
3800 LET Y=0
3810 LET M=0
3820 WRITE FILE[4,S1+1],M,V,X,Y,B
3830 CLOSE FILE[4]
3840 PRINT "RESULTS OF SCAN OF REPLICATE";P0;"ARE STORED."
3850 GOTO 1000
3860 REM   [EXIT/ESC FROM SAMPLE SCAN; RETURN TO SAMPLE CL]
3870 NOESC
3880 PRINT
3890 CLOSE
3900 GOTO 1000
3910 REM ----------  PEAK ABS. SEARCH SUBRT.
3920 ON ESC THEN RETURN
3930 LET X=0
3940 FOR I=1 TO (W1-W0+1)
3950   IF Z[I]<X THEN GOTO 3980
3960   LET X=Z[I]
3970   LET W=(W1-I+1)
3980 NEXT I
3990 LET F5=1
4000 RETURN
4010 REM ----------  PLOT FILE-STUFF SUBRT.
4020 ON ESC THEN RETURN
4030 LET F0$="UVVOC.PF"
4040 ON ERR THEN GOTO 4060
4050 RENAME F0$,F0$
4060 ON ERR THEN STOP
4070 IF SYS(7)=-48 THEN DELAY =1
4080 IF SYS(7)=-48 THEN GOTO 4040
4090 OPEN FILE[5,0],F0$,4
4100 ON ESC THEN GOTO 4200
4110 FOR I=0 TO (W1-W0)
4120   WRITE FILE[5,P2+I],Z[I+1]
4130 NEXT I
4140 LET X=P2+(W1-W0+1)
4150 WRITE FILE[5,0],X
4160 CLOSE FILE[5]
4170 ON ESC THEN RETURN
4180 LET F5=1
4190 RETURN
4200 NOESC

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                   PAGE 11
                      PROGRAM LISTING FOR UVV0.C2

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
4210 CLOSE FILE[5]
4220 RETURN
4230 REM ----------  DATA ACQUISITION/REDUCTION SUBROUTINE
4240 ON ESC THEN GOTO 5080
4250 LET F6=1
4260 LET X1=W1
4270 LET K1=X1
4280 LET C0=0
4290 REM   [MAKE SURE WAVELENGTH HIGH ENOUGH]
4300 ON ESC THEN GOTO 5080
4310 CALL 6,C6,N6,A6
4320 LET K0=Q1+A6*(Q2+Q3*A6)
4330 IF K0>K1 THEN GOTO 4440
4340 PRINT
4350 PRINT "SET WAVELENGTH UP";(K1-INT(K0)+1);"NM."
4360 ON ERR THEN GOTO 4400
4370 INPUT "PRESS CR KEY TO CONTINUE SCAN. ",A$
4380 ON ERR THEN STOP
4390 IF LEN(A$)=0 THEN GOTO 4300
4400 ON ERR THEN STOP
4410 PRINT "<7>"
4420 GOTO 4360
4430 REM   [MAKE SURE SCAN-TO WL. NOT BELOW (LOW WL.BOUND - 5)]
4440 LET K0=INT(K0)
4450 LET X0=K0-I0
4460 IF X0<(W0-5) THEN LET X0=(W0-5)
4470 PRINT "     SCANNING FROM";K0;"TO";X0;"NM.    ";
4480 REM   [SET #-OF-POINTS PARM. & SCAN]
4490 LET N0=(K0-X0+1)*2
4500 LET N7=N0-C0
4510 ON ESC THEN GOTO 5000
4520 ON ERR THEN GOTO 5320
4530 CALL 7,C7,D7,D8,N7,V0[1+C0]
4540 ON ESC THEN GOTO 5080
4550 ON ERR THEN STOP
4560 REM   [CHECK RANGE: HIGH ENOUGH START; OVER HALF SCANNED]
4570 LET W=Q1+V0[2]*(Q2+Q3*V0[2])
4580 LET Y=Q1+V0[N0]*(Q2+Q3*V0[N0])
4590 IF W<X1 THEN GOTO 4610
4600 IF (W-Y)>(N0/4) THEN GOTO 4730
4610 PRINT "<7>"
4620 PRINT "PROBLEM IN SCAN RANGE;"

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-
9/2/1980                                                   PAGE 12
                      PROGRAM LISTING FOR UVV0.C2

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
4630 PRINT "SET WAVELENGTH AT";X1+1;"NM.;"
4640 ON ERR THEN GOTO 4680
4650 INPUT "PRESS CR KEY TO CONTINUE SCAN. ",A$
4660 ON ERR THEN STOP
4670 IF LEN(A$)=0 THEN GOTO 4300
4680 ON ERR THEN STOP
4690 PRINT "<7>"
4700 GOTO 4640
4710 GOTO 4310
4720 REM   [DETERMINE LOWEST WAVELEN IN CALL 7 ARRAY]
4730 LET X0=-INT(-(Q1+V0[N0]*(Q2+Q3*V0[N0])))
4740 IF X0<W0 THEN LET X0=W0
4750 REM   [EVALUATE PERCENT TRANSMITTANCE VALUES]
4760 PRINT "EVALUATING AT";X1;"THRU";X0;"NM."
4770 LET J2=0
4780 ON ERR THEN STOP
4790 FOR I=X1 TO X0 STEP -1
4800   LET J2=J2+2
4810    IF J2>N0 THEN GOTO 4910
4820   LET W=Q1+V0[J2]*(Q2+Q3*V0[J2])
4830    IF W>=I THEN GOTO 4800
4840   LET J1=J2-2
4850   LET L=I
4860   LET Y=Q1+V0[J1]*(Q2+Q3*V0[J1])
4870   LET X=(I-Y)/(W-Y)
4880   LET Z[W1-L+1]=V0[J1-1]-X*(V0[J2-1]-V0[J1-1])
4890   LET J2=J1-2
4900 NEXT I
4910 LET X1=L-1
4920 IF X1<W0 THEN RETURN
4930 LET C0=((N0-J1)+2)
4940 FOR I=1 TO C0
4950   LET V0[I]=V0[(J1-2)+I]
4960 NEXT I
4970 LET K1=X1-1
4980 GOTO 4300
4990 REM   [ESCAPE DURING SCAN; ISSUE SCAN-CLEAR; ROUTE]
5000 LET N0=N7+C0
5010 LET C2=24823
5020 LET A2=0
5030 ON ERR THEN GOTO 5260
5040 CALL 257,C2,A2

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                         PAGE 13
                        PROGRAM LISTING FOR UVVO.C2

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
5050 ON ERR THEN STOP
5060 PRINT "<7>";
5070 PRINT "SCAN INTERRUPT."
5080 NOESC
5090 ON ESC THEN RETURN
5100 LET F6=2
5110 ESC
5120 ON ERR THEN GOTO 5190
5130 PRINT
5140 INPUT "RESTART SCAN ?  [N(CR) OR Y]  >>> ",A$
5150 ON ERR THEN STOP
5160 IF LEN(A$)=0 THEN LET A$="N"
5170 IF A$="N" THEN GOTO 5220
5180 IF A$="Y" THEN GOTO 5220
5190 ON ERR THEN STOP
5200 PRINT "<7>"
5210 GOTO 5120
5220 NOESC
5230 LET F6=2
5240 IF A$="N" THEN LET F6=3
5250 RETURN
5260 NOESC
5270 ON ERR THEN STOP
5280 PRINT "<7>"
5290 PRINT "UNEXPECTED ERROR IN CALL 257 SCAN-CLEAR."
5300 LET F6=2
5310 RETURN
5320 NOESC
5330 ON ERR THEN STOP
5340 PRINT "<7>"
5350 PRINT "UNEXPECTED ERROR IN CALL 7."
5360 LET F6=2
5370 RETURN
5380 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
5390 REM            SAMPLE REPLICATE (ONE) DELETION SECTION
5400 REM
5410 ON ESC THEN GOTO 6000
5420 LET F0$="UVVOC.DS"
5430 OPEN FILE[4,0],F0$,32
5440 READ FILE[4,0],S0,S1,S2
5450 READ FILE[4,S1],M,P0,P1,S$,D
5460 IF P0>0 THEN GOTO 5510

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                         PAGE 14
                        PROGRAM LISTING FOR UVVO.C2

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
5470 CLOSE FILE[4]
5480 PRINT "<7>"
5490 PRINT "NO REPLICATES OF SAMPLE ";S$;" HAVE YET BEEN SCANNED."
5500 GOTO 1000
5510 ON ERR THEN GOTO 5580
5520 PRINT
5530 PRINT "SAMPLE ";S$;" REPLICATE TO BE DELETED (1 TO ";
5540 PRINT STR$(P0);")  ";
5550 INPUT ">>> ",K
5560 ON ERR THEN STOP
5570 IF K>=1 THEN IF K<=P0 THEN IF K=INT(K) THEN GOTO 5610
5580 ON ERR THEN STOP
5590 PRINT "<7>"
5600 GOTO 5510
5610 LET J=S1+10
5620 FOR I=1 TO K
5630   LET J=J+1
5640   READ FILE[4,J],M
5650   IF M<>2 THEN GOTO 5630
5660   IF I=K THEN WRITE FILE[4,J],(-M)
5670 NEXT I
5680 LET M=1
5690 LET P0=P0-1
5700 WRITE FILE[4,S1],M,P0,P1,S$,D
5710 CLOSE FILE[4]
5720 LET F0$="UVVOC.PR"
5730 ON ERR THEN GOTO 5750
5740 RENAME F0$,F0$
5750 ON ERR THEN STOP
5760 IF SYS(7)=-48 THEN DELAY =1
5770 IF SYS(7)=-48 THEN GOTO 5730
5780 OPEN FILE[6,0],F0$,41
5790 READ FILE[6,0],B0
5800 FOR I=1 TO B0
5810   LET J=3+(I-1)*5
5820   READ FILE[6,J],L$
5830   IF POS(L$,S$,1)>0 THEN GOTO 5860
5840 NEXT I
5850 STOP
5860 LET J=J-5
5870 FOR I=1 TO (P0+1)
5880   LET J=J+5

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVV0.C2

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
5890   READ FILE[6,J+2],L$
5900   IF L$[18,18]="X" THEN GOTO 5880
5910   LET L=VAL(L$[18,18])
5920   IF L=K THEN LET L$[18,18]="X"
5930   IF L>K THEN LET L$[18,18]=STR$(I-1)
5940   WRITE FILE[6,J+2],L$
5950 NEXT I
5960 CLOSE FILE[6]
5970 PRINT
5980 PRINT "REPLICATE";K;"OF SAMPLE ";S$;" HAS BEEN DELETED."
5990 GOTO 1000
6000 NOESC
6010 CLOSE
6020 GOTO 1000
6030 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
6040 REM                INTERMEDIATE SAMPLE REPORT SECTION
6050 REM
6060 ON ESC THEN GOTO 1000
6070 IF P0>0 THEN GOTO 6110
6080 PRINT "<7>"
6090 PRINT "INSUFFICIENT SAMPLE DATA."
6100 GOTO 1000
6110 PRINT
6120 LET F5=0
6130 GOSUB 6910
6140 ON ESC THEN GOTO 6170
6150 ESC
6160 IF F5<>1 THEN GOTO 6200
6170 NOESC
6180 CLOSE
6190 GOTO 1000
6200 NOESC
6210 LET F3$="UVV0.C4"
6220 GOTO 6560
6230 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
6240 REM               SAMPLE ANALYSIS ENDING SECTION
6250 REM
6260 ON ESC THEN GOTO 6520
6270 CLOSE
6280 PRINT
6290 IF P0=0 THEN GOTO 6430
6300 LET F5=0

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVV0.C2

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
6310 GOSUB 6910
6320 ON ESC THEN GOTO 6520
6330 IF F5=1 THEN GOTO 6520
6340 LET F0$="UVV0C.DS"
6350 OPEN FILE[4,0],F0$,32
6360 READ FILE[4,0],S0,S1,S2
6370 READ FILE[4,S1],M,P0,P1
6380 LET S0=S0+1
6390 LET S1=P1
6400 LET S2=S2+1
6410 WRITE FILE[4,0],S0,S1,S2
6420 CLOSE FILE[4]
6430 LET F0$="UVV0C.RP"
6440 OPEN FILE[3,0],F0$,21
6450 READ FILE[3,3],I0$
6460 LET I0$[1,1]="M"
6470 WRITE FILE[3,3],I0$
6480 CLOSE FILE[3]
6490 LET P0=0
6500 LET F3$="UVV0.C1"
6510 GOTO 6560
6520 NOESC
6530 CLOSE
6540 GOTO 1000
6550 REM ----------  EXIT POINT
6560 NOESC
6570 CLOSE
6580 LET F0$="UVV00.TR"
6590 OPEN FILE[0,0],F0$,21
6600 WRITE FILE[0,1],F1$
6610 WRITE FILE[0,2],F2$
6620 WRITE FILE[0,3],F3$
6630 CLOSE FILE[0]
6640 CHAIN F3$
6650 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
6660 REM                    RESPONSE-PROCESS SUBROUTINE
6670 REM
6680 ON ESC THEN RETURN
6690 ON ERR THEN GOTO 6840
6700 INPUT "   [KEEP(CR) OR CHANGE]  >>> ",N3$
6710 ON ERR THEN STOP
6720 GOTO 6730

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
6730 IF LEN(N3$)>0 THEN GOTO 6760
6740 LET F5=2
6750 RETURN
6760 FOR I=1 TO LEN(N3$)
6770   IF POS(N4$,N3$[I,I],1)=0 THEN GOTO 6840
6780 NEXT I
6790 ON ERR THEN GOTO 6840
6800 IF VAL(N4$)=VAL(N4$) THEN GOTO 6810
6810 ON ERR THEN STOP
6820 LET F5=0
6830 RETURN
6840 LET F5=1
6850 PRINT "<7>"
6860 PRINT "INVALID RESPONSE."
6870 RETURN
6880 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
6890 REM                   COMPUTE-STATISTICS SUBROUTINE
6900 REM
6910 ON ESC THEN GOTO 7770
6920 LET F0$="UVVOC.DS"
6930 OPEN FILE[4,0],F0$,32
6940 ON ESC THEN GOSUB 7800
6950 READ FILE[4,0],S0,S1,S2
6960 READ FILE[4,S1],M,P0,P1
6970 LET F6=0
6980 MAT P=ZER
6990 LET J=S1+10
7000 FOR I=1 TO P0
7010   LET J=J+1
7020   READ FILE[4,J],M,V,B
7030   IF M<>2 THEN GOTO 7010
7040   READ FILE[4,J+1],M,O[1],O[2],O[3],O[4],O[5],O[6]
7050   READ FILE[4,J+2],M,H[1],H[2],H[3],H[4],R[1],R[2],U[1]
7060   READ FILE[4,J+3],M,H[5],H[6],H[7],H[8],R[3],R[4],U[2]
7070   IF F6=1 THEN GOTO 7240
7080   LET P[1,1]=P[1,1]+V
7090   LET P[1,4]=P[1,4]+B
7100   FOR K=1 TO 6
7110     LET P[2,K]=P[2,K]+O[K]
7120   NEXT K
7130   FOR K=0 TO 1
7140     LET X=K*4

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
7150     LET Y=5+K*3
7160     FOR L=1 TO 4
7170       LET P[Y,L]=P[Y,L]+H[L+X]
7180     NEXT L
7190     LET P[Y,5]=P[Y,5]+R[1+K*2]
7200     LET P[Y,6]=P[Y,6]+R[2+K*2]
7210     LET P[Y,7]=P[Y,7]+U[K+1]
7220   NEXT K
7230   GOTO 7390
7240   LET P[1,2]=P[1,2]+(P[1,1]-V)^2
7250   LET P[1,5]=P[1,5]+(P[1,4]-B)^2
7260   FOR K=1 TO 6
7270     LET P[3,K]=P[3,K]+(P[2,K]-O[K])^2
7280   NEXT K
7290   FOR K=0 TO 1
7300     LET X=K*4
7310     LET Y=6+K*3
7320     FOR L=1 TO 4
7330       LET P[Y,L]=P[Y,L]+(P[Y-1,L]-H[L+X])^2
7340     NEXT L
7350     LET P[Y,5]=P[Y,5]+(P[Y-1,5]-R[1+K*2])^2
7360     LET P[Y,6]=P[Y,6]+(P[Y-1,6]-R[2+K*2])^2
7370     LET P[Y,7]=P[Y,7]+(P[Y-1,7]-U[K+1])^2
7380   NEXT K
7390 NEXT I
7400 IF F6=1 THEN GOTO 7570
7410 LET J=1
7420 IF I0$[5,5]="K" THEN LET J=4
7430 FOR I=1 TO J STEP 3
7440   LET X=P[1,I]/P0
7450   LET K=INT(LOG(X)/LOG(10))
7460   LET X=INT(X*10^(3-K)+.5)*10^(K-3)
7470   LET P[1,I]=VAL(STR$(X))
7480 NEXT I
7490 FOR I=2 TO 8 STEP 3
7500   FOR J=1 TO 7
7510     LET P[I,J]=P[I,J]/P0
7520   NEXT J
7530 NEXT I
7540 IF P0=1 THEN GOTO 7710
7550 LET F6=1
7560 GOTO 6990

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVVO.C2

```
123456789112345678921234567893123456789412345678951234567896123456789 7
         0         0         0         0         0         0         0
7570 FOR I=0 TO 3 STEP 3
7580   LET P[1,I+2]=SQR(P[1,I+2]/(P0-1))
7590   IF P[1,I+1]<>0 THEN LET P[1,I+3]=P[1,I+2]/P[1,I+1]*100
7600 NEXT I
7610 FOR I=1 TO 6
7620   LET P[3,I]=SQR(P[3,I]/(P0-1))
7630   IF P[2,I]<>0 THEN LET P[4,I]=P[3,I]/P[2,I]*100
7640 NEXT I
7650 FOR I=5 TO 8 STEP 3
7660   FOR J=1 TO 7
7670     LET P[I+1,J]=SQR(P[I+1,J]/(P0-1))
7680     IF P[I,J]<>0 THEN LET P[I+2,J]=P[I+1,J]/P[I,J]*100
7690   NEXT J
7700 NEXT I
7710 LET M=0
7720 FOR I=1 TO 10
7730   WRITE FILE[4,S1+I],M,P[I,1],P[I,2],P[I,3],P[I,4],P[I,5],P[I,6],
*      P[I,7]
7740 NEXT I
7750 CLOSE FILE[4]
7760 RETURN
7770 NOESC
7780 LET F5=1
7790 RETURN
7800 NOESC
7810 LET F5=1
7820 ESC
7830 RETURN

123456789112345678921234567893123456789412345678951234567896123456789 7
         0         0         0         0         0         0         0
```

SYMBOL TABLE FOR UVVO.C2

```
SYMBOL    REFERENCES
------  -------------------------------------------------------------
 0370   0170
 0430   0360
 0920   1090
 1000   0870  0920  1360  1960  3850  3900  5500  5990  6020  6060
        6100  6190  6540
 1020   1130
 1100   1020
 1170   1090
 1310   1290
 1380   1330
 1410   1450  1470  1500
 1480   1450
 1510   1480
 1540   1580  1600  1630
 1610   1580
 1650   1510  1610
 1670   1710
 1690   1670
 1780   2790
 1790   1930  2910  3290
 1810   1880
 1860   1810
 1890   1850
 1970   1930
 2330   2270
 2360   2320
 2470   2440
 2510   2440
 2550   2440
 2580   2500  2540
 2730   2820
 2800   2730
 2830   2770  2780
 2930   2200
 2990   2930
 3000   2980
 3230   3320
 3300   3230
 3330   2830  3270  3280
 3390   3430
 3410   3390
 3870   1170  1440  1450  1570  1580  1910  1930  2300  2310  2860
        2880  2960  2970  3350  3370
 3920   2290  2950
 3980   3950
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE 21
                        SYMBOL TABLE FOR UVV0.C2

SYMBOL    REFERENCES
------   ------------------------------------------------------------------
 4020    2850  3340
 4040    4080
 4060    4040
 4200    4100
 4240    1900
 4300    4390  4670  4980
 4310    4710
 4360    4420
 4400    4360
 4440    4330
 4610    4590
 4640    4700
 4680    4640
 4730    4600
 4800    4830
 4910    4810
 5000    4510
 5080    4240  4300  4540
 5120    5210
 5190    5120
 5220    5170  5180
 5260    5030
 5320    4520
 5410    1090
 5510    5460  5600
 5580    5510
 5610    5570
 5630    5650
 5730    5770
 5750    5730
 5860    5830
 5880    5900
 6000    5410
 6060    1090
 6110    6070
 6170    6140
 6200    6160
 6260    1000  1090
 6430    6290
 6520    6260  6320  6330
 6560    0560  0580  6220  6510
 6680    1430  1560
 6730    6720
 6760    6730
 6810    6800
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE 22
                        SYMBOL TABLE FOR UVV0.C2

SYMBOL    REFERENCES
------   ------------------------------------------------------------------
 6840    6690  6770  6790
 6910    6130  6310
 6990    7560
 7010    7030
 7240    7070
 7390    7230
 7570    7400
 7710    7540
 7770    6910
 7800    6940
 A$      0210  1050  1070  1080  1830  1850  2750  2770  2780  2790
         3250  3270  3280  3290  4370  4390  4650  4670  5140  5160
         5170  5180  5240
 A2      5020  5040
 A6      0330  4310  4320
 B       1260  1310  1550  1590  1610  2610  3100  3700  3820  7020
         7090  7250
 B0      3450  3460  3470  3480  5790  5800
 C0      4280  4500  4530  4930  4940  5000
 C1$     0210  0260  1080
 C2      5010  5040
 C5      0500
 C6      0500  4310
 C7      0500  4530
 D       1210  2380  3680  3780  5450  5700
 D7      0300  4530
 D8      0310  0700  4530
 E       0790  2380
 F       2380  2390  2470  2480  2490  2510  2520  2530  2550  2560
         2570  3050  3060
 F0$     0220  0390  0430  0440  0590  0600  0640  0650  0730  0740
         0820  0830  1180  1190  1660  1680  1720  1970  1980  3380
         3400  3440  3650  3660  4030  4050  4090  5420  5430  5720
         5740  5780  6340  6350  6430  6440  6580  6590  6920  6930
 F1$     0220  0390  0450  0530  0550  6600
 F2$     0220  0390  0460  0530  0540  6610
 F3$     0220  0390  0470  0540  0550  6210  6500  6620  6640
 F4      0180  0400  0560
 F5      1410  1450  1540  1580  2280  2310  2840  2880  2940  2970
         3330  3370  3990  4180  6120  6160  6300  6330  6740  6820
         6840  7780  7810
 F6      1890  1930  4250  5100  5230  5240  5300  5360  6970  7070
         7400  7550
 FL#0    0440  0450  0460  0470  0480  0490  0500  0510  6590  6600
         6610  6620  6630
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                         PAGE 23
                        SYMBOL TABLE FOR UVV0.C2

SYMBOL   REFERENCES
------   -----------------------------------------------------------------
 FL#1    0600  0610  0620
 FL#2    0650  0660  0670  0680  1980  2000  2050
 FL#3    0740  0750  0760  0770  0780  0790  0800  6440  6450  6470
         6480
 FL#4    0830  0840  0850  0860  1190  1200  1210  1280  1320  3660
         3670  3680  3700  3720  3730  3740  3780  3820  3830  5430
         5440  5450  5470  5640  5700  5710  6350  6360  6370  6410
         6420  6930  6950  6960  7020  7040  7050  7060  7730  7750
 FL#5    1720  1730  1740  1750  4090  4120  4150  4160  4210
 FL#6    3440  3450  3470  3550  3570  3590  3610  3630  3640  5780
         5790  5820  5890  5940  5960
 H[      0280  2470  2480  2490  2510  2520  2530  2550  2560  2570
         2580  2590  2600  2610  2670  2700  3040  3050  3060  3070
         3080  3090  3100  3160  3190  3730  3740  7050  7060  7170
         7330
 I       1220  1230  1270  1280  1300  1310  1990  2000  2010  2020
         2030  2040  2090  2120  2130  2140  2160  2170  3510  3520
         3530  3550  3940  3950  3960  3970  3980  4110  4120  4130
         4790  4830  4850  4870  4900  4940  4950  4960  5620  5660
         5670  5800  5810  5840  5870  5930  5950  6760  6770  6780
         7000  7390  7430  7440  7470  7480  7490  7510  7530  7570
         7580  7590  7600  7610  7620  7630  7640  7650  7670  7680
         7700  7720  7730  7740
 I0      0340  0350  4450
 I0$     0240  0780  1390  1510  1530  2250  2270  2340  2350  2390
         2430  2640  2720  2830  2930  3130  3210  3490  3500  3520
         6450  6460  6470  7420
 J       3530  3540  3550  5610  5630  5640  5660  5810  5820  5860
         5880  5890  5940  6990  7010  7020  7040  7050  7060  7410
         7420  7430  7500  7510  7520  7660  7670  7680  7690
 J1      4840  4860  4880  4890  4930  4950
 J2      4770  4800  4810  4820  4840  4880  4890
 K       3480  3550  3570  3590  3610  3630  5550  5570  5620  5660
         5920  5930  5980  7100  7110  7120  7130  7140  7150  7190
         7200  7210  7220  7260  7270  7280  7290  7300  7310  7350
         7360  7370  7380  7450  7460
 K0      4320  4330  4350  4440  4450  4470  4490
 K1      4270  4330  4350  4970
 L       3540  3550  4850  4880  4910  5910  5920  5930  7160  7170
         7180  7320  7330  7340
 L$      0250  2650  2660  2670  2680  2690  2700  2710  2720  3140
         3150  3160  3170  3180  3190  3200  3210  3490  3500  3550
         3560  3570  3580  3590  3600  3610  3620  3630  5820  5830
         5890  5900  5910  5920  5930  5940
 L0      0790  2380
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                         PAGE 24
                        SYMBOL TABLE FOR UVV0.C2

SYMBOL   REFERENCES
------   -----------------------------------------------------------------
 M       0850  1210  1240  1280  1290  1310  3680  3690  3700  3710
         3720  3730  3740  3770  3780  3810  3820  5450  5640  5650
         5660  5680  5700  6370  6960  7020  7030  7040  7050  7060
         7710  7730
 N0      4490  4500  4580  4600  4730  4810  4930  5000
 N1$     0230  0480
 N2$     0230  0490
 N3$     0230  1460  1590  6700  6730  6760  6770
 N4$     0230  0270  6770  6800
 N6      0320  4310
 N7      4500  4530  5000
 O       2220
 O[      0280  2230  2260  2360  2370  2400  2410  2420  3000  3010
         3020  3030  3720  7040  7110  7270
 P       1080  1090  2430  2440  6980
 P0      0850  1210  1220  1230  1330  1770  3600  3680  3750  3780
         3840  5450  5460  5540  5570  5690  5700  5870  6070  6290
         6370  6490  6960  7000  7440  7510  7540  7580  7620  7670
 P1      0850  1210  1220  3680  3700  3720  3730  3740  3760  3780
         5450  5700  6370  6390  6960
 P2      1650  1730  1740  2900  3530  4120  4140
 P[      0280  7080  7090  7110  7170  7190  7200  7210  7240  7250
         7270  7330  7350  7360  7370  7440  7470  7510  7580  7590
         7620  7630  7670  7680  7730
 Q1      0610  4320  4570  4580  4730  4820  4860
 Q2      0610  4320  4570  4580  4730  4820  4860
 Q3      0610  4320  4570  4580  4730  4820  4860
 R       0660  0700
 R1$     0240  0750
 R2$     0240  0760
 R3$     0240  0770  3580
 R[      0280  2590  2600  2700  3080  3090  3190  3730  3740  7050
         7060  7190  7200  7350  7360
 S$      0210  0850  1210  3560  3680  3780  5450  5490  5530  5700
         5830  5980
 S0      0840  1200  3670  5440  6360  6380  6410  6950
 S1      0840  0850  1200  1210  1230  3670  3680  3780  3820  5440
         5450  5610  5700  6360  6370  6390  6410  6950  6960  6990
         7730
 S2      0840  1200  3670  5440  6360  6400  6410  6950
 U[      0280  2610  2720  3100  3210  3730  3740  7050  7060  7210
         7370
 V       1250  1310  1420  1460  1480  2380  3700  3820  7020  7080
         7240
 V$      0250  1380  1390  1420  1520  1530  1550  1780  1800  1870
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE 25
                       SYMBOL TABLE FOR UVV0.C2

SYMBOL    REFERENCES
------    ---------------------------------------------------------------
          2200  2630  2640  2650  2680  2890  3120  3130  3140  3220
VOI       0350  4530  4570  4580  4730  4820  4860  4880  4950
W         2010  2020  2030  2080  2110  2120  2130  2140  2150  2190
          2240  2250  2260  2330  2340  2350  2360  2400  2470  2480
          2490  2510  2520  2530  2550  2560  2570  2990  3000  3970
          4570  4590  4600  4820  4830  4870
W0        0670  0710  1990  2090  2180  2190  2900  3530  3540  3550
          3940  4110  4140  4460  4740  4920
W1        0670  0710  1820  1990  2000  2010  2020  2030  2090  2180
          2190  2230  2260  2360  2370  2900  3000  3010  3530  3540
          3550  3940  3970  4110  4140  4260  4880
X         0660  2000  2010  2020  2070  2100  2110  2180  2410  2470
          2480  2490  2510  2520  2530  2550  2560  2570  3020  3040
          3050  3060  3790  3820  3930  3950  3960  4140  4150  4870
          4880  7140  7170  7300  7330  7440  7450  7460  7470
X0        4450  4460  4470  4490  4730  4740  4760  4790
X1        4260  4270  4590  4630  4760  4790  4910  4920  4970
Y         2000  2020  2100  2160  2420  2470  2480  2490  2510  2520
          2530  2550  2560  2570  3030  3040  3050  3060  3800  3820
          4580  4600  4860  4870  7150  7170  7190  7200  7210  7310
          7330  7350  7360  7370
ZI        0710  2010  2020  2030  2070  2080  2120  2130  2140  2160
          2180  2190  2230  2260  2360  2370  3000  3010  3950  3960
          4120  4880
```

MANUAL CHLOROPHYLL SAMPLE ANALYSIS MODULE -- UVVO.C5

UVVO.C5 is quite similar to the automated chlorophyll sample analysis module UVVO.C2. Therefore the following material exposes the essential differences between the two modules. Variable descriptions for UVVO.C5 are found in Table 17, and an overview flowchart of the module is shown in Figure 10.

UVVO.C5 is chained to from UVVO.CO or UVVO.C4. In the program initialization section of UVVO.C5, parameters are needed from only the files UVVOO.TR, UVVOC.RP, and UVVOC.DS. Also, one additional character is retrieved from the string of run-parameter flags: the data-entry flag.

At command level, the automated sample analysis command "S" (for scanning one replicate) is replaced by an "I" command (for entering input data of one replicate).

The procedure for the input of replicate data is nearly the same as that of the scan and data reduction procedure in UVVO.C2. One key difference is the replacement of the Data Acquisition/Reduction subroutine operation by a data entry routine. In this routine, a prompt is displayed for each value to be entered by a user. Should the input be percent transmittance values (as indicated by the data-entry flag), then the values are converted to absorbance units. The other major difference is that the module need not be concerned with a plot data file or a plot reference file.

The replicate deletion section imitates that of UVVO.C2, except that there is no need to deal with the plot reference file.

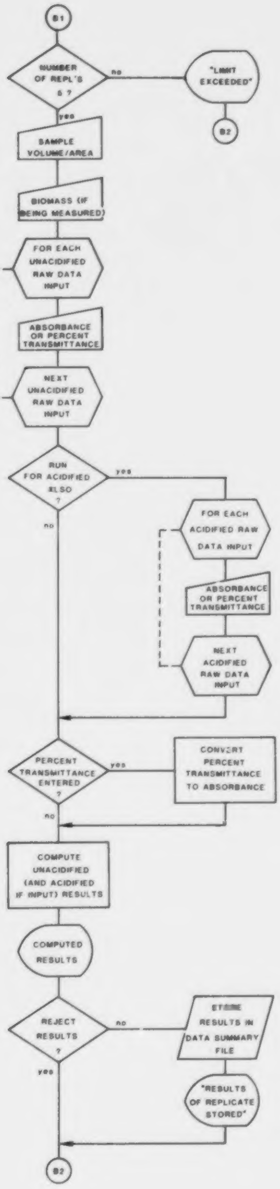

B1
NUMBER OF REPL'S ≤ 7 ?
no
"LIMIT EXCEEDED"
B2
yes
SAMPLE VOLUME/AREA
BIOMASS (IF BEING MEASURED)
FOR EACH UNACIDIFIED RAW DATA INPUT
ABSORBANCE OR PERCENT TRANSMITTANCE
NEXT UNACIDIFIED RAW DATA INPUT
RUN FOR ACIDIFIED ALSO ?
yes
no
FOR EACH ACIDIFIED RAW DATA INPUT
ABSORBANCE OR PERCENT TRANSMITTANCE
NEXT ACIDIFIED RAW DATA INPUT
PERCENT TRANSMITTANCE ENTERED ?
yes
CONVERT PERCENT TRANSMITTANCE TO ABSORBANCE
no
COMPUTE UNACIDIFIED (AND ACIDIFIED IF INPUT) RESULTS
COMPUTED RESULTS
REJECT RESULTS ?
no
STORE RESULTS IN DATA SUMMARY FILE
"RESULTS OF REPLICATE STORED"
yes
B2

Figure 12. Flowchart of the input section of module UVVO.C5.

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                     PAGE  1
                    PROGRAM LISTING FOR UVV0.C5

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0010 REM        ++++++++++++++++++++++++++++++++++++
0020 REM        +    AUTOMATED  ULTRAVIOLET-VISIBLE   +
0030 REM        +      SPECTROPHOTOMETER SYSTEM       +
0040 REM        +      MANUAL CHLOROPHYLL SAMPLE      +
0050 REM        +       ANALYSIS MODULE: UVV0.C5      +
0060 REM        +    WRITTEN BY GREG ROTH (4/14/80)   +
0070 REM        +    UNIV. OF CINCI. COMPUTER CENTER  +
0080 REM        +    (UVV0.C5 IF SUB-MOD. OF MANUAL   +
0090 REM        +     DATA ENTRY CHLOR. MOD. UVV0.C0) +
0100 REM        ++++++++++++++++++++++++++++++++++++
0110 REM
0120 REM
0130 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0140 REM                      PROGRAM INITIALIZATION
0150 REM
0160 REM ----------  SET PAGE/ESC/ROUTE-FLAG
0170 PAGE =72
0180 ON ESC THEN GOTO 0310
0190 LET F4=0
0200 ESC
0210 REM ----------  DIM/INIT STRING VARS. AND ARRAYS
0220 DIM C1$[5],S$[8],A$[1]
0230 DIM F0$[13],F1$[13],F2$[13],F3$[13]
0240 DIM N1$[20],N2$[20],N3$[12],N4$[12]
0250 DIM R1$[18],R2$[18],R3$[20],I0$[7]
0260 DIM L$[72],V$[16]
0270 LET C1$="IDREH"
0280 LET N4$="0123456789-."
0290 DIM O[6],H[8],R[4],U[2],P[10,7]
0300 GOTO 0370
0310 NOESC
0320 CLOSE
0330 DIM F0$[13],F1$[13],F2$[13],F3$[13]
0340 LET F4=1
0350 REM
0360 REM ----------  RETRIEVE SYSTEM STATUS PARMS.
0370 LET F0$="UVV00.TR"
0380 OPEN FILE[0,0],F0$,21
0390 READ FILE[0,1],F1$
0400 READ FILE[0,2],F2$
0410 READ FILE[0,3],F3$
0420 READ FILE[0,4],N1$

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                     PAGE  2
                    PROGRAM LISTING FOR UVV0.C5

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0430 READ FILE[0,5],N2$
0440 CLOSE FILE[0]
0450 REM   [MODIFY PROGRAM LOCATION VARS.]
0460 LET F1$=F2$
0470 LET F2$=F3$
0480 LET F3$=F1$
0490 IF F4=1 THEN GOTO 3860
0500 REM ----------  RETRIEVE CHLOROPHYLL RUN PARMS.
0510 ON ESC THEN GOTO 3860
0520 LET F0$="UVV0C.RP"
0530 OPEN FILE[3,0],F0$,21
0540 READ FILE[3,0],R1$
0550 READ FILE[3,1],R2$
0560 READ FILE[3,2],R3$
0570 READ FILE[3,3],I0$
0580 READ FILE[3,4],E,L0
0590 CLOSE FILE[3]
0600 REM ----------  RETRIEVE BASIC DATA SUMMARY INFO.
0610 LET F0$="UVV0C.DS"
0620 OPEN FILE[4,0],F0$,32
0630 READ FILE[4,0],S0,S1,S2
0640 READ FILE[4,S1],M,P0,P1,S$
0650 CLOSE FILE[4]
0660 GOTO 0790
0670 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0680 REM                   SAMPLE ANALYSIS COMMAND LEVEL
0690 REM
0700 REM ----------  SAMPLE ANALYSIS COMMAND LIST
0710 ON ESC THEN GOTO 0790
0720 PRINT
0730 PRINT "I  ---  INPUT OF DATA OF ONE REPLICATE"
0740 PRINT "D  ---  DELETION OF ONE REPLICATE"
0750 PRINT "R  ---  INTERMEDIATE SAMPLE REPORT"
0760 PRINT "E  ---  END OF ANALYSIS OF THIS SAMPLE"
0770 PRINT "H  ---  HELP"
0780 REM ----------  SAMPLE ANALYSIS COMMAND SELECT
0790 ON ESC THEN GOTO 3560
0800 ESC
0810 ON ERR THEN GOTO 0890
0820 PRINT
0830 PRINT "SAMPLE ANALYSIS COMMANDS:  ";
0840 INPUT "I, D, R, E, H(CR)  >>> ",A$

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0850 ON ERR THEN STOP
0860 IF LEN(A$)=0 THEN LET A$="H"
0870 LET P=POS(C1$,A$,1)
0880 ON P THEN GOTO 0960, 2960, 3360, 3560, 0710
0890 ON ERR THEN STOP
0900 PRINT "<7>"
0910 PRINT "INVALID COMMAND."
0920 GOTO 0810
0930 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0940 REM                       SAMPLE DATA INPUT SECTION
0950 REM
0960 ON ESC THEN GOTO 2890
0970 LET F0$="UVVOC.DS"
0980 OPEN FILE[4,0],F0$,32
0990 READ FILE[4,0],S0,S1,S2
1000 READ FILE[4,S1],M,P0,P1,S$,D
1010 IF P0>0 THEN LET I=P1-4
1020 IF P0=0 THEN LET I=S1-1
1030 LET M=0
1040 LET V=0
1050 LET B=0
1060 FOR I=I TO 12 STEP -1
1070   READ FILE[4,I],M
1080   IF M=2 THEN GOTO 1100
1090 NEXT I
1100 IF M=2 THEN READ FILE[4,I],M,V,B
1110 CLOSE FILE[4]
1120 IF P0<5 THEN GOTO 1170
1130 PRINT "<7>"
1140 PRINT "MAY NOT EXCEED LIMIT OF 5 REPLICATES."
1150 GOTO 0790
1160 REM ----------  GET REPLICATE PARMS.
1170 LET V$="VOLUME (LITERS)"
1180 IF I0$[2,2]="E" THEN LET V$="AREA (M^2)"
1190 PRINT
1200 LET F5=3
1210 PRINT "SAMPLE ";V$;" : ";V;
1220 GOSUB 3980
1230 ON ESC THEN GOTO 2890
1240 ON F5 THEN GOTO 1200, 1270, 2890
1250 LET V=VAL(N3$)
1260 GOTO 1200

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
1270 IF V>0 THEN GOTO 1300
1280 PRINT "<7>";
1290 GOTO 1200
1300 IF I0$[5,5]="I" THEN GOTO 1440
1310 LET V$="MG/L"
1320 IF I0$[2,2]="E" THEN LET V$="G/M^2"
1330 LET F5=3
1340 PRINT "BIOMASS (";V$;") : ";B;
1350 GOSUB 3980
1360 ON ESC THEN GOTO 2890
1370 ON F5 THEN GOTO 1330, 1400, 2890
1380 LET B=VAL(N3$)
1390 GOTO 1330
1400 IF B>0 THEN GOTO 1440
1410 PRINT "<7>";
1420 GOTO 1330
1430 REM ----------  ENTER REPLICATE DATA
1440 LET V$=" 645 663 665"
1450 IF I0$[6,6]="S" THEN LET V$[5,8]=" 665"
1460 IF I0$[6,6]="J" THEN LET V$[1,8]=" 647 664"
1470 IF I0$[4,4]="F" THEN LET V$[5,12]="PEAKPEAK"
1480 PRINT
1490 PRINT "ENTER DATA OF REPLICATE";(P0+1);":   WAVELEN.   ";
1500 IF I0$[7,7]="A" THEN PRINT "ABSORB."
1510 IF I0$[7,7]="T" THEN PRINT "%-TRANS."
1520 PRINT  TAB(30);"--------   --------"
1530 MAT O=ZER
1540 MAT H=ZER
1550 MAT R=ZER
1560 MAT U=ZER
1570 PRINT  TAB(14);"UNACIDIFIED  --";
1580 FOR I=1 TO 4
1590    ON ERR THEN GOTO 1670
1600    PRINT  TAB(30);
1610    IF I=1 THEN PRINT " 630";
1620    IF I>=2 THEN IF I<=3 THEN PRINT V$[(I-2)*4+1,(I-1)*4];
1630    IF I=4 THEN PRINT " 750";
1640    INPUT " NM.    ",O[I]
1650    ON ERR THEN STOP
1660    GOTO 1700
1670    ON ERR THEN STOP
1680    PRINT "<7>"

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
12345678911234567892123456789312345678941234567895123456789612345678970
         0         0         0         0         0         0         0
1690    GOTO 1590
1700 NEXT I
1710 IF IO$[3,3]="N" THEN GOTO 1850
1720 PRINT  TAB(16);"ACIDIFIED  --";
1730 FOR I=5 TO 6
1740   ON ERR THEN GOTO 1810
1750   PRINT  TAB(30);
1760   IF I=5 THEN PRINT V$[9,12];
1770   IF I=6 THEN PRINT " 750";
1780   INPUT " NM.    ",O[I]
1790   ON ERR THEN STOP
1800   GOTO 1840
1810   ON ERR THEN STOP
1820   PRINT "<7>"
1830   GOTO 1740
1840 NEXT I
1850 IF IO$[7,7]="A" THEN GOTO 1920
1860 LET J=6
1870 IF IO$[3,3]="N" THEN LET J=4
1880 FOR I=1 TO J
1890   IF O[I]>0 THEN LET O[I]=-LOG(O[I]/100)/LOG(10)
1900   IF O[I]<=0 THEN LET O[I]=2
1910 NEXT I
1920 LET F=(E*D)/(V*L0)
1930 IF IO$[2,2]="E" THEN LET F=F/1000
1940 LET W=O[3]-O[4]
1950 LET X=O[2]-O[4]
1960 LET Y=O[1]-O[4]
1970 LET P=POS("USJ",IO$[6,6],1)
1980 ON P THEN GOTO 2010, 2050, 2090
1990 PRINT "<7>ERROR; 'P' BRANCH-POINT."
2000 STOP
2010 LET H[1]=F*(11.64*W-2.16*X+.1*Y)
2020 LET H[2]=F*(-3.94*W+20.97*X-3.66*Y)
2030 LET H[3]=F*(-5.53*W-14.81*X+54.22*Y)
2040 GOTO 2120
2050 LET H[1]=F*(11.6*W-1.31*X-.14*Y)
2060 LET H[2]=F*(-4.34*W+20.7*X-4.42*Y)
2070 LET H[3]=F*(-4.64*W-16.3*X+55*Y)
2080 GOTO 2120
2090 LET H[1]=F*(11.85*W-1.54*X-8E-02*Y)
2100 LET H[2]=F*(-5.43*W+21.03*X-2.66*Y)

12345678911234567892123456789312345678941234567895123456789612345678970
         0         0         0         0         0         0         0
```

```
12345678911234567892123456789312345678941234567895123456789612345678970
         0         0         0         0         0         0         0
2110 LET H[3]=F*(-1.67*W-7.6*X+24.52*Y)
2120 LET H[4]=H[1]+H[2]+H[3]
2130 IF H[2]=0 THEN GOTO 2150
2140 LET R[1]=H[1]/H[2]
2150 IF H[3]=0 THEN GOTO 2170
2160 LET R[2]=H[1]/H[3]
2170 IF H[1]=0 THEN GOTO 2190
2180 LET U[1]=B*1000/H[1]
2190 PRINT
2200 PRINT "UNACIDIFIED SCAN RESULTS:"
2210 LET V$="MG/M^3"
2220 IF IO$[2,2]="E" THEN LET V$[6,6]="2"
2230 LET L$="   (IN ",V$,")  CHL A: ----#.###   "
2240 LET L$=L$,"CHL B: ----#.###   CHL C: -----#.###"
2250 PRINT USING L$,H[1],H[2],H[3]
2260 LET L$="   TOTAL CHL: -----#.### ",V$
2270 LET L$=L$,"     CHL RATIOS   A/B:--#.##  A/C:--#.##"
2280 PRINT USING L$,H[4],R[1],R[2]
2290 LET L$="   AUTOTROPHIC INDEX: ----#.####"
2300 IF IO$[5,5]="K" THEN PRINT USING L$,U[1]
2310 IF IO$[3,3]="N" THEN GOTO 2570
2320 LET X=O[5]-O[6]
2330 LET Y=O[3]-O[4]
2340 IF Y=0 THEN GOTO 2360
2350 LET H[5]=Y/X
2360 LET H[6]=F*26.73*(Y-X)
2370 LET H[7]=F*26.73*(1.7*X-Y)
2380 LET H[8]=H[6]+H[2]+H[3]
2390 IF H[2]=0 THEN GOTO 2410
2400 LET R[3]=H[6]/H[2]
2410 IF H[3]=0 THEN GOTO 2430
2420 LET R[4]=H[6]/H[3]
2430 IF H[6]=0 THEN GOTO 2450
2440 LET U[2]=B*1000/H[6]
2450 PRINT
2460 PRINT "ACIDIFIED SCAN RESULTS:"
2470 LET V$="MG/M^3"
2480 IF IO$[2,2]="E" THEN LET V$[6,6]="2"
2490 LET L$="   IN ",V$,",  CHL A':----#.###"
2500 LET L$=L$,"  PHEO A:----#.###  TOTAL CHL:-----#.###"
2510 PRINT USING L$,H[6],H[7],H[8]
2520 LET L$="   RATIOS,  ABS(UNACID/ACID): ---#.##  "

12345678911234567892123456789312345678941234567895123456789612345678970
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2530 LET L$=L$," CHLS  A'/B:--#.##  A'/C:--#.##"
2540 PRINT USING L$,H[5],R[3],R[4]
2550 LET L$="   AUTOTROPHIC INDEX: ----#.####"
2560 IF I0$[5,5]="K" THEN PRINT USING L$,U[2]
2570 ON ERR THEN GOTO 2640
2580 PRINT
2590 INPUT "REJECT RESULTS ?  [N(CR) OR Y]  >>> ",A$
2600 ON ERR THEN STOP
2610 IF LEN(A$)=0 THEN GOTO 2670
2620 IF A$="N" THEN GOTO 2670
2630 IF A$="Y" THEN GOTO 1440
2640 ON ERR THEN STOP
2650 PRINT "<7>"
2660 GOTO 2570
2670 LET F0$="UVVOC.DS"
2680 OPEN FILE[4,0],F0$,32
2690 READ FILE[4,0],S0,S1,S2
2700 READ FILE[4,S1],M,P0,P1,S$,D
2710 LET M=2
2720 WRITE FILE[4,P1],M,V,B
2730 LET M=0
2740 WRITE FILE[4,P1+1],M,O[1],O[2],O[3],O[4],O[5],O[6]
2750 WRITE FILE[4,P1+2],M,H[1],H[2],H[3],H[4],R[1],R[2],U[1]
2760 WRITE FILE[4,P1+3],M,H[5],H[6],H[7],H[8],R[3],R[4],U[2]
2770 LET P0=P0+1
2780 LET P1=P1+4
2790 LET M=1
2800 WRITE FILE[4,S1],M,P0,P1,S$,D
2810 LET X=0
2820 LET Y=0
2830 LET M=0
2840 WRITE FILE[4,S1+1],M,V,X,Y,B
2850 CLOSE FILE[4]
2860 PRINT "RESULTS OF REPLICATE";P0;"ARE STORED."
2870 GOTO 0790
2880 REM   [EXIT/ESC FROM SAMPLE SCAN; RETURN TO SAMPLE CL]
2890 NOESC
2900 PRINT
2910 CLOSE
2920 GOTO 0790
2930 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
2940 REM          SAMPLE REPLICATE (ONE) DELETION SECTION
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2950 REM
2960 ON ESC THEN GOTO 3300
2970 LET F0$="UVVOC.DS"
2980 OPEN FILE[4,0],F0$,32
2990 READ FILE[4,0],S0,S1,S2
3000 READ FILE[4,S1],M,P0,P1,S$,D
3010 IF P0>0 THEN GOTO 3060
3020 CLOSE FILE[4]
3030 PRINT "<7>"
3040 PRINT "NO REPLICATES OF SAMPLE ";S$;" HAVE YET BEEN SCANNED."
3050 GOTO 0790
3060 ON ERR THEN GOTO 3130
3070 PRINT
3080 PRINT "SAMPLE ";S$;" REPLICATE TO BE DELETED (1 TO ";
3090 PRINT STR$(P0);")  ";
3100 INPUT ">>> ",K
3110 ON ERR THEN STOP
3120 IF K>=1 THEN IF K<=P0 THEN IF K=INT(K) THEN GOTO 3160
3130 ON ERR THEN STOP
3140 PRINT "<7>"
3150 GOTO 3060
3160 LET J=S1+10
3170 FOR I=1 TO K
3180   LET J=J+1
3190   READ FILE[4,J],M
3200   IF M<>2 THEN GOTO 3180
3210   IF I=K THEN WRITE FILE[4,J],(-M)
3220 NEXT I
3230 LET M=1
3240 LET P0=P0-1
3250 WRITE FILE[4,S1],M,P0,P1,S$,D
3260 CLOSE FILE[4]
3270 PRINT
3280 PRINT "REPLICATE";K;"OF SAMPLE ";S$;" HAS BEEN DELETED."
3290 GOTO 0790
3300 NOESC
3310 CLOSE
3320 GOTO 0790
3330 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
3340 REM               INTERMEDIATE SAMPLE REPORT SECTION
3350 REM
3360 ON ESC THEN GOTO 0790
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE  9
                      PROGRAM LISTING FOR UVV0.C5

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
3370 IF P0>0 THEN GOTO 3410
3380 PRINT "<7>"
3390 PRINT "INSUFFICIENT SAMPLE DATA."
3400 GOTO 0790
3410 PRINT
3420 LET F5=0
3430 GOSUB 4210
3440 ON ESC THEN GOTO 3470
3450 ESC
3460 IF F5<>1 THEN GOTO 3500
3470 NOESC
3480 CLOSE
3490 GOTO 0790
3500 NOESC
3510 LET F3$="UVV0.C4"
3520 GOTO 3860
3530 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
3540 REM                 SAMPLE ANALYSIS ENDING SECTION
3550 REM
3560 ON ESC THEN GOTO 3820
3570 CLOSE
3580 PRINT
3590 IF P0=0 THEN GOTO 3730
3600 LET F5=0
3610 GOSUB 4210
3620 ON ESC THEN GOTO 3820
3630 IF F5=1 THEN GOTO 3820
3640 LET F0$="UVV0C.DS"
3650 OPEN FILE[4,0],F0$,32
3660 READ FILE[4,0],S0,S1,S2
3670 READ FILE[4,S1],M,P0,P1
3680 LET S0=S0+1
3690 LET S1=P1
3700 LET S2=S2+1
3710 WRITE FILE[4,0],S0,S1,S2
3720 CLOSE FILE[4]
3730 LET F0$="UVV0C.RP"
3740 OPEN FILE[3,0],F0$,21
3750 READ FILE[3,3],I0$
3760 LET I0$[1,1]="M"
3770 WRITE FILE[3,3],I0$
3780 CLOSE FILE[3]

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE 10
                      PROGRAM LISTING FOR UVV0.C5

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
3790 LET P0=0
3800 LET F3$="UVV0.C0"
3810 GOTO 3860
3820 NOESC
3830 CLOSE
3840 GOTO 0790
3850 REM ----------  EXIT POINT
3860 NOESC
3870 CLOSE
3880 LET F0$="UVV00.TR"
3890 OPEN FILE[0,0],F0$,21
3900 WRITE FILE[0,1],F1$
3910 WRITE FILE[0,2],F2$
3920 WRITE FILE[0,3],F3$
3930 CLOSE FILE[0]
3940 CHAIN F3$
3950 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
3960 REM                    RESPONSE-PROCESS SUBROUTINE
3970 REM
3980 ON ESC THEN RETURN
3990 ON ERR THEN GOTO 4140
4000 INPUT "   [KEEP(CR) OR CHANGE]  >>> ",N3$
4010 ON ERR THEN STOP
4020 GOTO 4030
4030 IF LEN(N3$)>0 THEN GOTO 4060
4040 LET F5=2
4050 RETURN
4060 FOR I=1 TO LEN(N3$)
4070   IF POS(N4$,N3$[I,I],1)=0 THEN GOTO 4140
4080 NEXT I
4090 ON ERR THEN GOTO 4140
4100 IF VAL(N4$)=VAL(N4$) THEN GOTO 4110
4110 ON ERR THEN STOP
4120 LET F5=0
4130 RETURN
4140 LET F5=1
4150 PRINT "<7>"
4160 PRINT "INVALID RESPONSE."
4170 RETURN
4180 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
4190 REM                   COMPUTE-STATISTICS SUBROUTINE
4200 REM

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVVO.C5

```
12345678911234567892123456789312345678941234567895123456789612345678 97
         0         0         0         0         0         0         0
4210 ON ESC THEN GOTO 5070
4220 LET F0$="UVVOC.DS"
4230 OPEN FILE[4,0],F0$,32
4240 ON ESC THEN GOSUB 5100
4250 READ FILE[4,0],S0,S1,S2
4260 READ FILE[4,S1],M,P0,P1
4270 LET F6=0
4280 MAT P=ZER
4290 LET J=S1+10
4300 FOR I=1 TO P0
4310   LET J=J+1
4320   READ FILE[4,J],M,V,B
4330   IF M<>2 THEN GOTO 4310
4340   READ FILE[4,J+1],M,O[1],O[2],O[3],O[4],O[5],O[6]
4350   READ FILE[4,J+2],M,H[1],H[2],H[3],H[4],R[1],R[2],U[1]
4360   READ FILE[4,J+3],M,H[5],H[6],H[7],H[8],R[3],R[4],U[2]
4370   IF F6=1 THEN GOTO 4540
4380   LET P[1,1]=P[1,1]+V
4390   LET P[1,4]=P[1,4]+B
4400   FOR K=1 TO 6
4410     LET P[2,K]=P[2,K]+O[K]
4420   NEXT K
4430   FOR K=0 TO 1
4440     LET X=K*4
4450     LET Y=5+K*3
4460     FOR L=1 TO 4
4470       LET P[Y,L]=P[Y,L]+H[L+X]
4480     NEXT L
4490     LET P[Y,5]=P[Y,5]+R[1+K*2]
4500     LET P[Y,6]=P[Y,6]+R[2+K*2]
4510     LET P[Y,7]=P[Y,7]+U[K+1]
4520   NEXT K
4530   GOTO 4690
4540   LET P[1,2]=P[1,2]+(P[1,1]-V)^2
4550   LET P[1,5]=P[1,5]+(P[1,4]-B)^2
4560   FOR K=1 TO 6
4570     LET P[3,K]=P[3,K]+(P[2,K]-O[K])^2
4580   NEXT K
4590   FOR K=0 TO 1
4600     LET X=K*4
4610     LET Y=6+K*3
4620     FOR L=1 TO 4

12345678911234567892123456789312345678941234567895123456789612345678 97
         0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVVO.C5

```
12345678911234567892123456789312345678941234567895123456789612345678 97
         0         0         0         0         0         0         0
4630       LET P[Y,L]=P[Y,L]+(P[Y-1,L]-H[L+X])^2
4640     NEXT L
4650     LET P[Y,5]=P[Y,5]+(P[Y-1,5]-R[1+K*2])^2
4660     LET P[Y,6]=P[Y,6]+(P[Y-1,6]-R[2+K*2])^2
4670     LET P[Y,7]=P[Y,7]+(P[Y-1,7]-U[K+1])^2
4680   NEXT K
4690 NEXT I
4700 IF F6=1 THEN GOTO 4870
4710 LET J=1
4720 IF I0$[5,5]="K" THEN LET J=4
4730 FOR I=1 TO J STEP 3
4740   LET X=P[1,I]/P0
4750   LET K=INT(LOG(X)/LOG(10))
4760   LET X=INT(X*10^(3-K)+.5)*10^(K-3)
4770   LET P[1,I]=VAL(STR$(X))
4780 NEXT I
4790 FOR I=2 TO 8 STEP 3
4800   FOR J=1 TO 7
4810     LET P[I,J]=P[I,J]/P0
4820   NEXT J
4830 NEXT I
4840 IF P0=1 THEN GOTO 5010
4850 LET F6=1
4860 GOTO 4290
4870 FOR I=0 TO 3 STEP 3
4880   LET P[1,I+2]=SQR(P[1,I+2]/(P0-1))
4890   IF P[1,I+1]<>0 THEN LET P[1,I+3]=P[1,I+2]/P[1,I+1]*100
4900 NEXT I
4910 FOR I=1 TO 6
4920   LET P[3,I]=SQR(P[3,I]/(P0-1))
4930   IF P[2,I]<>0 THEN LET P[4,I]=P[3,I]/P[2,I]*100
4940 NEXT I
4950 FOR I=5 TO 8 STEP 3
4960   FOR J=1 TO 7
4970     LET P[I+1,J]=SQR(P[I+1,J]/(P0-1))
4980     IF P[I,J]<>0 THEN LET P[I+2,J]=P[I+1,J]/P[I,J]*100
4990   NEXT J
5000 NEXT I
5010 LET M=0
5020 FOR I=1 TO 10
5030   WRITE FILE[4,S1+I],M,P[I,1],P[I,2],P[I,3],P[I,4],P[I,5],P[I,6],
*      P[I,7]

12345678911234567892123456789312345678941234567895123456789612345678 97
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                         PAGE 13
                       PROGRAM LISTING FOR UVV0.C5

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
5040 NEXT I
5050 CLOSE FILE[4]
5060 RETURN
5070 NOESC
5080 LET F5=1
5090 RETURN
5100 NOESC
5110 LET F5=1
5120 ESC
5130 RETURN











































1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                         PAGE 14
                       SYMBOL TABLE FOR UVV0.C5

SYMBOL   REFERENCES
------   ---------------------------------------------------------------
0310     0180
0370     0300
0710     0880
0790     0660  0710  1150  2870  2920  3050  3290  3320  3360  3400
         3490  3840
0810     0920
0890     0810
0960     0880
1100     1080
1170     1120
1200     1240  1260  1290
1270     1240
1300     1270
1330     1370  1390  1420
1400     1370
1440     1300  1400  2630
1590     1690
1670     1590
1700     1660
1740     1830
1810     1740
1840     1800
1850     1710
1920     1850
2010     1980
2050     1980
2090     1980
2120     2040  2080
2150     2130
2170     2150
2190     2170
2360     2340
2410     2390
2430     2410
2450     2430
2570     2310  2660
2640     2570
2670     2610  2620
2890     0960  1230  1240  1360  1370
2960     0880
3060     3010  3150
3130     3060
3160     3120
3180     3200
3300     2960
```

```
A-U-T-'-D    U-V-V-I-S    S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R    S-Y-S-T-E-M
9/2/1980                                                          PAGE 15
                         SYMBOL TABLE FOR UVV0.C5

SYMBOL    REFERENCES
------    ---------------------------------------------------------------
 3360  0880
 3410  3370
 3470  3440
 3500  3460
 3560  0790  0880
 3730  3590
 3820  3560  3620  3630
 3860  0490  0510  3520  3810
 3980  1220  1350
 4030  4020
 4060  4030
 4110  4100
 4140  3990  4070  4090
 4210  3430  3610
 4290  4860
 4310  4330
 4540  4370
 4690  4530
 4870  4700
 5010  4840
 5070  4210
 5100  4240
 A$    0220  0840  0860  0870  2590  2610  2620  2630
 B     1050  1100  1340  1380  1400  2180  2440  2720  2840  4320
       4390  4550
 C1$   0220  0270  0870
 D     1000  1920  2700  2800  3000  3250
 E     0580  1920
 F     1920  1930  2010  2020  2030  2050  2060  2070  2090  2100
       2110  2360  2370
 F0$   0230  0330  0370  0380  0520  0530  0610  0620  0970  0980
       2670  2680  2970  2980  3640  3650  3730  3740  3880  3890
       4220  4230
 F1$   0230  0330  0390  0460  0480  3900
 F2$   0230  0330  0400  0460  0470  3910
 F3$   0230  0330  0410  0470  0480  3510  3800  3920  3940
 F4    0190  0340  0490
 F5    1200  1240  1330  1370  3420  3460  3600  3630  4040  4120
       4140  5080  5110
 F6    4270  4370  4700  4850
 FL#0  0380  0390  0400  0410  0420  0430  0440  3890  3900  3910
       3920  3930
 FL#3  0530  0540  0550  0560  0570  0580  0590  3740  3750  3770
       3780
 FL#4  0620  0630  0640  0650  0980  0990  1000  1070  1110  2680
```

```
A-U-T-'-D    U-V-V-I-S    S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R    S-Y-S-T-E-M
9/2/1980                                                          PAGE 16
                         SYMBOL TABLE FOR UVV0.C5

SYMBOL    REFERENCES
------    ---------------------------------------------------------------
          2690  2700  2720  2740  2750  2760  2800  2840  2850  2980
          2990  3000  3020  3190  3250  3260  3650  3660  3670  3710
          3720  4230  4250  4260  4320  4340  4350  4360  5030  5050
 H        1540
 HI       0290  2010  2020  2030  2050  2060  2070  2090  2100  2110
          2120  2130  2140  2150  2160  2170  2180  2250  2280  2350
          2360  2370  2380  2390  2400  2410  2420  2430  2440  2510
          2540  2750  2760  4350  4360  4470  4630
 I        1010  1020  1060  1070  1090  1100  1580  1610  1620  1630
          1640  1700  1730  1760  1770  1780  1840  1880  1890  1900
          1910  3170  3210  3220  4060  4070  4080  4300  4690  4730
          4740  4770  4780  4790  4810  4830  4870  4880  4890  4900
          4910  4920  4930  4940  4950  4970  4980  5000  5020  5030
          5040
 I0$      0250  0570  1180  1300  1320  1450  1460  1470  1500  1510
          1710  1850  1870  1930  1970  2220  2300  2310  2480  2560
          3750  3760  3770  4720
 J        1860  1870  1880  3160  3180  3190  3210  4290  4310  4320
          4340  4350  4360  4710  4720  4730  4800  4810  4820  4960
          4970  4980  4990
 K        3100  3120  3170  3210  3280  4400  4410  4420  4430  4440
          4450  4490  4500  4510  4520  4560  4570  4580  4590  4600
          4610  4650  4660  4670  4680  4750  4760
 L        4460  4470  4480  4620  4630  4640
 L$       0260  2230  2240  2250  2260  2270  2280  2290  2300  2490
          2500  2510  2520  2530  2540  2550  2560
 L0       0580  1920
 M        0640  1000  1030  1070  1080  1100  2700  2710  2720  2730
          2740  2750  2760  2790  2800  2830  2840  3000  3190  3200
          3210  3230  3250  3670  4260  4320  4330  4340  4350  4360
          5010  5030
 N1$      0240  0420
 N2$      0240  0430
 N3$      0240  1250  1380  4000  4030  4060  4070
 N4$      0240  0280  4070  4100
 O        1530
 OI       0290  1640  1780  1890  1900  1940  1950  1960  2320  2330
          2740  4340  4410  4570
 P        0870  0880  1970  1980  4280
 P0       0640  1000  1010  1020  1120  1490  2700  2770  2800  2860
          3000  3010  3090  3120  3240  3250  3370  3590  3670  3790
          4260  4300  4740  4810  4840  4880  4920  4970
 P1       0640  1000  1010  2700  2720  2740  2750  2760  2780  2800
          3000  3250  3670  3690  4260
 PI       0290  4380  4390  4410  4470  4490  4500  4510  4540  4550
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE 17
                           SYMBOL TABLE FOR UVV0.C5

SYMBOL    REFERENCES
------  ----------------------------------------------------------------
          4570  4630  4650  4660  4670  4740  4770  4810  4880  4890
          4920  4930  4970  4980  5030
R         1550
R1$       0250  0540
R2$       0250  0550
R3$       0250  0560
R[        0290  2140  2160  2280  2400  2420  2540  2750  2760  4350
          4360  4490  4500  4650  4660
S$        0220  0640  1000  2700  2800  3000  3040  3080  3250  3280
S0        0630  0990  2690  2990  3660  3680  3710  4250
S1        0630  0640  0990  1000  1020  2690  2700  2800  2840  2990
          3000  3160  3250  3660  3670  3690  3710  4250  4260  4290
          5030
S2        0630  0990  2690  2990  3660  3700  3710  4250
U         1560
U[        0290  2180  2300  2440  2560  2750  2760  4350  4360  4510
          4670
V         1040  1100  1210  1250  1270  1920  2720  2840  4320  4380
          4540
V$        0260  1170  1180  1210  1310  1320  1340  1440  1450  1460
          1470  1620  1760  2210  2220  2230  2260  2470  2480  2490
W         1940  2010  2020  2030  2050  2060  2070  2090  2100  2110
X         1950  2010  2020  2030  2050  2060  2070  2090  2100  2110
          2320  2350  2360  2370  2810  2840  4440  4470  4600  4630
          4740  4750  4760  4770
Y         1960  2010  2020  2030  2050  2060  2070  2090  2100  2110
          2330  2340  2350  2360  2370  2820  2840  4450  4470  4490
          4500  4510  4610  4630  4650  4660  4670
```

CHLOROPHYLL ANALYSIS SUMMARY REPORT MODULE -- UVVO.C3

UVVO.C3 is chained to from the automated or manual chlorophyll analysis module (UVVO.C1 an UVVO.CO). The report module retrieves parameters from the system status transfer file and from the chlorophyll run-parameters file. Before report preparation, a prompt is given for the optional inclusion of raw data into the report.

The records of the report are placed in a list file named UVVLPT. A front page heading is first formatted into the report. Data preparation follows for raw data (if requested), sample results, and biomass results (if measured). Before each segment of information, a secondary heading is formatted. Report lines are counted until a page is filled, at which time an informal page heading is prepared, and if necessary, another secondary heading.

The page and secondary headings are prepared by module subroutines. When heading material for subsequent pages is formatted, the material is preceded and followed by a records which contain simply an ampersand symbol.

Once the report is readied, the module presents options for terminal output, lineprinter output, and continuance of the analysis procedure. For a terminal report, material between the ampersand-marked records, inclusive, is ignored. Also, no more than one blank line in succession is printed. For lineprinter report, only the records with the ampersand symbol are skipped, while all other material is sent to the lineprinter file $LPT. To continue, the module branches to the chlorophyll module return point.

At the chlorophyll module return point, the module writes the modified program location variables to the system status transfer file. It then chains to the "destination" program, which is the chained-from module UVVO.C1 or UVVO.CO.

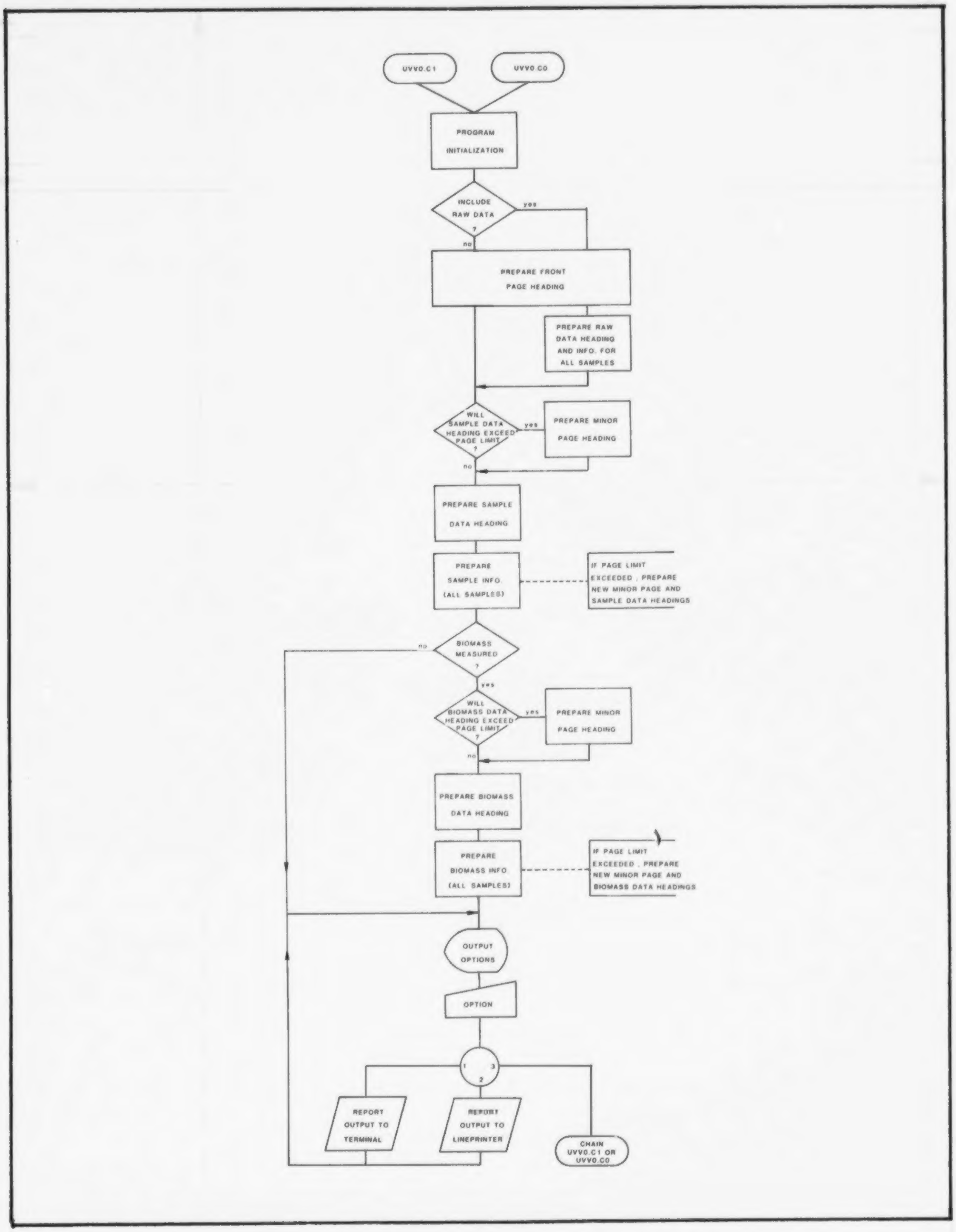

UVVO.C1
UVVO.C0
PROGRAM INITIALIZATION
INCLUDE RAW DATA ?
yes
no
PREPARE FRONT PAGE HEADING
PREPARE RAW DATA HEADING AND INFO. FOR ALL SAMPLES
WILL SAMPLE DATA HEADING EXCEED PAGE LIMIT ?
yes
PREPARE MINOR PAGE HEADING
no
PREPARE SAMPLE DATA HEADING
PREPARE SAMPLE INFO. (ALL SAMPLES)
IF PAGE LIMIT EXCEEDED , PREPARE NEW MINOR PAGE AND SAMPLE DATA HEADINGS
BIOMASS MEASURED ?
no
yes
WILL BIOMASS DATA HEADING EXCEED PAGE LIMIT ?
yes
PREPARE MINOR PAGE HEADING
no
PREPARE BIOMASS DATA HEADING
PREPARE BIOMASS INFO. (ALL SAMPLES)
IF PAGE LIMIT EXCEEDED , PREPARE NEW MINOR PAGE AND BIOMASS DATA HEADINGS
OUTPUT OPTIONS
OPTION
1
2
3
REPORT OUTPUT TO TERMINAL
REPORT OUTPUT TO LINEPRINTER
CHAIN UVVO.C1 OR UVVO.C0

Figure 13. Flowchart of module UVVO.C3.

TABLE 18. VARIABLE DESCRIPTIONS FOR MODULES UVVO.C3 AND UVVO.C4

A$	a single-character user-response variable
B	the biomass
B$	a character string composed of blanks
D**	the dilution factor of a sample
D$*	the character string for "A.M." or "P.M." time
D1*,D2*,D3*	the chlorophyll analysis date (month, day, year)
E	the extract volume of a chlorophyll run
FO$	a file name variable
F1$, F2$, F3$	program location variables; see Table 1
F4	a flag used during program initialization
F5$	a flag used by the page heading and secondary heading subroutines of UVVO.C3, where initially set to zero, is returned as: F5 = 0 for escape during subroutine F5 = 1 for completed subroutine function
HO*	the secondary heading indicator, where: HO = 1 for raw data heading HO = 2 for sample results heading HO = 3 for biomass results heading
H()	primarily chlorophyll concentrations; see Table 17
I	a loop-counter and general-purpose variable
IO$	the character string of user-chosen run-parameter flags
J, K*	loop-counter and general-purpose variables
L	the cell path length for the chlorophyll run
L$	an output and output-format character string
LO*	the line counter
L1*	the limit of report lines per page
L2*	the number of lines available per page
M	the marker (first item) of each record in the data summary file; see Table 16
M1*,M2*,M3*	the report date (month, day, year)
N1$, N2$	the analyst's and instrument's names
O()	the raw data values; see Table 17
P	in UVVO.C3 the page counter;in UVVO.C4, a branching variable
PO	the replicate counter (number of replicates of a sample)
P1	the replicate pointer (to next repl. header record in UVVOC.DS)
P()**	a matrix containing replicate statistics
R1$, R3$, R3$	chlorophyll run-parameter character strings; see Table 17
R()	ratio results; see Table 17
S$	the sample identifier

TABLE 18. (Continued)

S0	the sample counter (number of samples analyzed)
S1	the sample pointer (to next sample header record in UVVOC.DS)
U()	autotrophic indeces: U(1) -- uncorrected: U(2) -- corrected
V	the sample volume/area
V$	a general-purpose character string
W$	a control character in each output list file record
W**, X, Y	general-purpose variables

* Single-starred variables are used in UVVO.C3 only.

** Double-starred variables are used in UVVO.C4 only.

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                      PAGE  1
                    PROGRAM LISTING FOR UVV0.C3

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0010 REM           +++++++++++++++++++++++++++++++++++++++++
0020 REM           +    AUTOMATED  ULTRAVIOLET-VISIBLE     +
0030 REM           +       SPECTROPHOTOMETER SYSTEM        +
0040 REM           +    CHLOROPHYLL  ANALYSIS  SUMMARY     +
0050 REM           +        REPORT MODULE: UVV0.C3         +
0060 REM           +    WRITTEN BY GREG ROTH (4/11/80)     +
0070 REM           +    UNIV. OF CINCI. COMPUTER CENTER    +
0080 REM           +++++++++++++++++++++++++++++++++++++++++
0090 REM
0100 REM
0110 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0120 REM                   PROGRAM INITIALIZATION
0130 REM
0140 REM ----------  SET PAGE/ESC/ROUTE-FLAG
0150 PAGE =72
0160 ON ESC THEN GOTO 0310
0170 LET F4=0
0180 ESC
0190 REM ----------  DIM/INIT STRING VARS. & ARRAYS
0200 DIM A$[1],L$[72],W$[1],B$[40],V$[12],D$[4]
0210 DIM F0$[13],F1$[13],F2$[13],F3$[13]
0220 DIM R1$[18],R2$[18],R3$[20],I0$[6]
0230 DIM N1$[20],N2$[20]
0240 DIM O[6],H[8],R[4],U[2]
0250 FOR I=1 TO 40
0260   LET B$[I,I]=" "
0270 NEXT I
0280 LET L1=58
0290 LET L2=66
0300 GOTO 0360
0310 NOESC
0320 CLOSE
0330 DIM F0$[13],F1$[13],F2$[13],F3$[13]
0340 LET F4=1
0350 REM ----------  RETRIEVE SYSTEM STATUS PARMS.
0360 LET F0$="UVV00.TR"
0370 OPEN FILE[0,0],F0$,21
0380 READ FILE[0,1],F1$
0390 READ FILE[0,2],F2$
0400 READ FILE[0,3],F3$
0410 READ FILE[0,4],N1$
0420 READ FILE[0,5],N2$

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                      PAGE  2
                    PROGRAM LISTING FOR UVV0.C3

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0430 CLOSE FILE[0]
0440 REM   [MODIFY PROGRAM LOCATION VARS.]
0450 LET F1$=F2$
0460 LET F2$=F3$
0470 LET F3$=F1$
0480 IF F4=1 THEN GOTO 2270
0490 REM ----------  RETRIEVE CHLOROPHYLL RUN PARMS.
0500 ON ESC THEN GOTO 2270
0510 LET F0$="UVVOC.RP"
0520 OPEN FILE[3,0],F0$,21
0530 READ FILE[3,0],R1$
0540 READ FILE[3,1],R2$
0550 READ FILE[3,2],R3$
0560 READ FILE[3,3],I0$
0570 READ FILE[3,4],E,L,D1,D2,D3
0580 CLOSE FILE[3]
0590 REM ----------  RAW DATA OPTION
0600 ON ERR THEN GOTO 0670
0610 PRINT
0620 INPUT "INCLUDE RAW DATA IN REPORT ?  [N(CR) OR Y]  >>> ",A$
0630 ON ERR THEN STOP
0640 IF LEN(A$)=0 THEN LET A$="N"
0650 IF A$="N" THEN GOTO 0740
0660 IF A$="Y" THEN GOTO 0740
0670 ON ERR THEN STOP
0680 PRINT "<7>"
0690 GOTO 0600
0700 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0710 REM                     REPORT PREPARATION
0720 REM
0730 REM ----------  SET PAGE COUNTER; INIT LIST FILE; PREP FRONT HDG.
0740 LET P=1
0750 LET F0$="UVVOC.DS"
0760 OPEN FILE[4,0],F0$,32
0770 OPEN FILE[1,1],"UVVLPT"
0780 LET F5=0
0790 GOSUB 2410
0800 ON ESC THEN GOTO 2270
0810 IF F5=0 THEN GOTO 2270
0820 IF A$="N" THEN GOTO 1090
0830 REM ----------  PREPARE RAW DATA (HDG FLAG = 1)
0840 LET H0=1

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE  3
                    PROGRAM LISTING FOR UVVO.C3

12345678911234567892123456789312345678941234567895123456789612345678970
         0         0         0         0         0         0         0
0850 LET F5=0
0860 GOSUB 3250
0870 ON ESC THEN GOTO 2270
0880 IF F5=0 THEN GOTO 2270
0890 READ FILE[4,0],S0,S1
0900 LET P1=1
0910 FOR I=1 TO S0
0920   LET J=P1
0930   READ FILE[4,J],M,P0,P1,S$
0940   IF M<>1 THEN GOTO 0920
0950   READ FILE[4,J+1],M,V
0960   READ FILE[4,J+2],M,O[1],O[2],O[3],O[4],O[5],O[6]
0970   IF I0$[3,3]="A" THEN GOTO 1000
0980   PRINT FILE[1],USING L$,S$,V,O[1],O[2],O[3],O[4]
0990   GOTO 1010
1000   PRINT FILE[1],USING L$,S$,V,O[1],O[2],O[3],O[4],O[5],O[6]
1010   LET L0=L0+1
1020   IF L0<L1 THEN GOTO 1070
1030   LET F5=0
1040   GOSUB 2410
1050   ON ESC THEN GOTO 2270
1060   IF F5=0 THEN GOTO 2270
1070 NEXT I
1080 REM ----------  PREPARE SAMPLE DATA (HDG FLAG = 2)
1090 LET H0=2
1100 IF L0+5<=L1 THEN GOTO 1160
1110 LET F5=0
1120 GOSUB 2410
1130 ON ESC THEN GOTO 2270
1140 IF F5=0 THEN GOTO 2270
1150 GOTO 1200
1160 LET F5=0
1170 GOSUB 3250
1180 ON ESC THEN GOTO 2270
1190 IF F5=0 THEN GOTO 2270
1200 READ FILE[4,0],S0,S1
1210 LET P1=1
1220 FOR I=1 TO S0
1230   LET J=P1
1240   READ FILE[4,J],M,P0,P1,S$
1250   IF M<>1 THEN GOTO 1230
1260   READ FILE[4,J+5],M,H[1],H[2],H[3],H[4]

12345678911234567892123456789312345678941234567895123456789612345678970
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE  4
                    PROGRAM LISTING FOR UVVO.C3

12345678911234567892123456789312345678941234567895123456789612345678970
         0         0         0         0         0         0         0
1270   READ FILE[4,J+8],M,H[5],H[6],H[7],H[8]
1280   LET X=8
1290   IF I0$[3,3]="N" THEN LET X=4
1300   PRINT FILE[1],USING L$,S$,H[6],H[7],H[1],H[2],H[3],H[X]
1310   LET L0=L0+1
1320   IF L0<L1 THEN GOTO 1370
1330   LET F5=0
1340   GOSUB 2410
1350   ON ESC THEN GOTO 2270
1360   IF F5=0 THEN GOTO 2270
1370 NEXT I
1380 IF I0$[5,5]="I" THEN GOTO 1710
1390 REM ----------  PREPARE BIOMASS DATA (HDG FLAG = 3)
1400 LET H0=3
1410 IF L0+4<=L1 THEN GOTO 1470
1420 LET F5=0
1430 GOSUB 2410
1440 ON ESC THEN GOTO 2270
1450 IF F5=0 THEN GOTO 2270
1460 GOTO 1510
1470 LET F5=0
1480 GOSUB 3250
1490 ON ESC THEN GOTO 2270
1500 IF F5=0 THEN GOTO 2270
1510 LET P1=1
1520 FOR I=1 TO S0
1530   LET J=P1
1540   READ FILE[4,J],M,P0,P1,S$
1550   IF M<>1 THEN GOTO 1530
1560   READ FILE[4,J+1],M,V,X,Y,B
1570   READ FILE[4,J+5],M,H[1],H[2],H[3],H[4],X,Y,U[1]
1580   READ FILE[4,J+8],M,H[5],H[6],H[7],H[8],X,Y,U[2]
1590   IF I0$[3,3]="A" THEN PRINT FILE[1],USING L$,S$,B,U[1],U[2]
1600   IF I0$[3,3]="N" THEN PRINT FILE[1],USING L$,S$,B,U[1]
1610   LET L0=L0+1
1620   IF L0<L1 THEN GOTO 1670
1630   LET F5=0
1640   GOSUB 2410
1650   ON ESC THEN GOTO 2270
1660   IF F5=0 THEN GOTO 2270
1670 NEXT I
1680 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

12345678911234567892123456789312345678941234567895123456789612345678970
         0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVV0.C3

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
1690 REM                    REPORT OUTPUT
1700 REM
1710 CLOSE
1720 ON ESC THEN GOTO 2270
1730 ESC
1740 ON ERR THEN GOTO 1820
1750 PRINT
1760 PRINT "SUMMARY REPORT:  ";
1770 PRINT "TERMINAL[1], LINEPRINTER[2], CONTINUE[3(CR)]";
1780 INPUT "  >>> ",A$
1790 ON ERR THEN STOP
1800 IF LEN(A$)=0 THEN LET A$="3"
1810 ON (POS("123",A$,1)) THEN GOTO 1870, 2050, 2270
1820 ON ERR THEN STOP
1830 PRINT "<7>"
1840 PRINT "PLEASE ENTER 1, 2, OR 3(CR)."
1850 GOTO 1740
1860 REM ----------  TERMINAL OUTPUT
1870 ON ESC THEN GOTO 2210
1880 OPEN FILE[1,3],"UVVLPT"
1890 LET I=0
1900 LREAD FILE[1],L$,W$
1910 IF EOF(1)=1 THEN GOTO 2210
1920 IF LEN(L$)>0 THEN GOTO 1960
1930 LET I=I+1
1940 IF I>1 THEN GOTO 1900
1950 GOTO 1980
1960 LET I=0
1970 IF L$="&" THEN GOTO 2010
1980 LET L$=L$,W$
1990 PRINT L$;
2000 GOTO 1900
2010 LREAD FILE[1],L$,W$
2020 IF L$="&" THEN GOTO 1900
2030 GOTO 2010
2040 REM ----------  LINEPRINTER OUTPUT
2050 ON ESC THEN GOTO 2210
2060 OPEN FILE[1,3],"UVVLPT"
2070 ON ERR THEN GOTO 2160
2080 OPEN FILE[7,1],"$LPT"
2090 ON ERR THEN STOP
2100 LREAD FILE[1],L$,W$

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVV0.C3

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2110 IF EOF(1)=1 THEN GOTO 2210
2120 IF L$="&" THEN GOTO 2100
2130 LET L$=L$,W$
2140 PRINT FILE[7],B$[1,4];L$
2150 GOTO 2100
2160 PRINT "<7>"
2170 PRINT "TEMPORARY LINEPRINTER DELAY; PLEASE WAIT."
2180 DELAY =8
2190 GOTO 2070
2200 REM   [EXIT (ESC) TO OUTPUT OPTIONS]
2210 NOESC
2220 CLOSE
2230 PRINT
2240 GOTO 1710
2250 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
2260 REM             CHLOROPHYLL MODULE RETURN POINT
2270 NOESC
2280 CLOSE
2290 PRINT
2300 LET F0$="UVV00.TR"
2310 OPEN FILE[0,0],F0$,21
2320 WRITE FILE[0,1],F1$
2330 WRITE FILE[0,2],F2$
2340 WRITE FILE[0,3],F3$
2350 CLOSE
2360 CHAIN F3$
2370 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
2380 REM              HEADINGS SUBROUTINES
2390 REM
2400 REM ----------  PAGE HEADING SUBRT.
2410 ON ESC THEN RETURN
2420 IF P>1 THEN GOTO 3000
2430 PRINT FILE[1]
2440 PRINT FILE[1]
2450 LET L$=B$[1,15],"***************************************"
2460 PRINT FILE[1],L$
2470 LET L$=B$[1,15],"*",B$[1,37],"*"
2480 PRINT FILE[1],L$
2490 LET L$=B$[1,15],"*                UVVIS                *"
2500 PRINT FILE[1],L$
2510 LET L$=B$[1,15],"*",B$[1,37],"*"
2520 PRINT FILE[1],L$

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2530 LET L$=B$[1,15],"*  CHLOROPHYLL  COMPUTATION  SUMMARY  *"
2540 PRINT FILE[1],L$
2550 LET L$=B$[1,15],"*",B$[1,37],"*"
2560 PRINT FILE[1],L$
2570 LET L$=B$[1,15],"***************************************"
2580 PRINT FILE[1],L$
2590 PRINT FILE[1]
2600 LET L$=B$[1,19],"DATE/TIME:  "
2610 LET M1=SYS(3)
2620 LET M1=M1-INT(M1/100)*100
2630 LET M2=SYS(11)
2640 LET M3=SYS(12)
2650 LET D$="A.M."
2660 IF M2>=12 THEN LET D$[1,1]="P"
2670 LET M2=M2-INT(M2/13)*12
2680 LET L$=L$,STR$(SYS(2)),"/",STR$(SYS(1)),"/",STR$(M1)
2690 LET L$=L$,"  ",STR$(M2),":"
2700 IF M3<10 THEN LET L$=L$,"0"
2710 LET L$=L$,STR$(M3)," ",D$
2720 PRINT FILE[1],L$
2730 PRINT FILE[1]
2740 PRINT FILE[1]
2750 LET L$="ANALYST: ####################"
2760 LET L$=L$,B$[1,43-LEN(L$)],"DATE ANALYZED: ##/##/##"
2770 LET D3=D3-INT(D3/100)*100
2780 PRINT FILE[1],USING L$,N1$,D1,D2,D3
2790 LET L$="STAION/STUDY: ",R1$
2800 LET L$=L$,B$[1,43-LEN(L$)],"SAMPLE TYPE: "
2810 IF IO$[2,2]="P" THEN LET L$=L$,"PLANKTON"
2820 IF IO$[2,2]="E" THEN LET L$=L$,"PERIPHYTON"
2830 PRINT FILE[1],L$
2840 LET L$="EXTRACTION METHOD: ####################"
2850 LET L$=L$,B$[1,43-LEN(L$)],"EXTRACT VOLUME: ####.## ML"
2860 PRINT FILE[1],USING L$,R2$,E
2870 LET L$="COMPUTATION METHOD: "
2880 IF IO$[6,6]="U" THEN LET L$=L$,"UNESCO"
2890 IF IO$[6,6]="S" THEN LET L$=L$,"STRICKLAND-PARSONS"
2900 IF IO$[6,6]="J" THEN LET L$=L$,"JEFFREY-HUMPHREY"
2910 LET L$=L$,B$[1,43-LEN(L$)],"CELL PATH LENGTH: ###.## CM"
2920 PRINT FILE[1],USING L$,L
2930 LET L$="INSTRUMENT: ",N2$
2940 LET L$=L$,B$[1,43-LEN(L$)],"COMMENT: ",R3$

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2950 PRINT FILE[1],L$
2960 LET L0=18
2970 LET P=P+1
2980 LET F5=1
2990 RETURN
3000 PRINT FILE[1],"&"
3010 FOR K=L0 TO L2
3020   PRINT FILE[1]
3030 NEXT K
3040 LET L$=B$,B$[1,24],"PAGE ##"
3050 PRINT FILE[1],USING L$,P
3060 LET L$=B$[1,26],"UVVIS  CHLOROPHYLL"
3070 PRINT FILE[1],L$
3080 LET L$=B$[1,25],"COMPUTATION  SUMMARY"
3090 PRINT FILE[1],L$
3100 PRINT FILE[1]
3110 LET L$=B$[1,19],"DATE/TIME:  ",STR$(SYS(2))
3120 LET L$=L$,"/",STR$(SYS(1)),"/",STR$(M1)
3130 LET L$=L$,"  ",STR$(M2)
3140 IF M3<10 THEN LET L$=L$,"0"
3150 LET L$=L$,STR$(M3)," ",D$
3160 PRINT FILE[1],L$
3170 LET L0=6
3180 LET F5=0
3190 GOSUB 3250
3200 IF F5=0 THEN RETURN
3210 PRINT FILE[1],"&"
3220 LET P=P+1
3230 RETURN
3240 REM ----------  SECONDARY HEADING SUBRT.
3250 ON ESC THEN RETURN
3260 PRINT FILE[1]
3270 PRINT FILE[1]
3280 ON H0 THEN GOTO 3330, 3660, 3850
3290 PRINT "<7>"
3300 PRINT "ERROR: H0 =";H0
3310 STOP
3320 REM   [RAW DATA SECONDARY HDG.]
3330 LET L$="[RAW DATA]  SAMPLE   (BEFORE ACIDIFICATION) ABSORB. AT"
3340 IF IO$[3,3]="A" THEN LET L$=L$,"  (AFTER) ABS. AT"
3350 PRINT FILE[1],L$
3360 LET L$="  SAMPLE   VOLUME   --------------------------------"

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                          PAGE  9
                       PROGRAM LISTING FOR UVV0.C3

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
3370 IF I0$[2,2]="E" THEN LET L$[13,18]=" AREA "
3380 IF I0$[3,3]="A" THEN LET L$=L$,"  ---------------"
3390 PRINT FILE[1],L$
3400 LET L$="  ID NO.   [LITERS]  630 NM   "
3410 IF I0$[2,2]="E" THEN LET L$[12,19]=" [M^2]  "
3420 LET V$="645"
3430 IF I0$[6,6]="J" THEN LET V$="647"
3440 LET V$[4,9]=" PEAK "
3450 IF I0$[4,4]="F" THEN GOTO 3490
3460 LET V$[4,9]="663 NM"
3470 IF I0$[6,6]="S" THEN LET V$[4,6]="665"
3480 IF I0$[6,6]="J" THEN LET V$[4,6]="664"
3490 LET L$=L$,"### NM   ######   750 NM"
3500 IF I0$[3,3]="N" THEN GOTO 3540
3510 IF I0$[4,4]="M" THEN LET L$=L$,"  665 NM"
3520 IF I0$[4,4]="F" THEN LET L$=L$,"   PEAK "
3530 LET L$=L$,"   750 NM"
3540 PRINT FILE[1],USING L$,V$[1,3],V$[4,9]
3550 LET V$="  ------ "
3560 LET L$=" --------  ---------",V$,V$,V$,V$
3570 IF I0$[3,3]="A" THEN LET L$=L$,V$[2],V$[1,8]
3580 PRINT FILE[1],L$
3590 LET V$=" -#.#### "
3600 LET L$=" ########  #.##^^^^",V$,V$,V$,V$
3610 IF I0$[3,3]="A" THEN LET L$=L$,V$[2],V$[1,8]
3620 LET L0=L0+6
3630 LET F5=1
3640 RETURN
3650 REM   [SAMPLE DATA SECONDARY HDG.]
3660 LET L$=B$[1,14],"CHL-A     PHEO-A     CHL-A"
3670 LET L$=L$,"    CHL-B     CHL-C      TOTAL"
3680 PRINT FILE[1],L$
3690 LET L$="  SAMPLE    (CORREC.)",B$[1,12],"(UNCORR.)"
3700 LET L$=L$,B$[1,22],"CHLORO."
3710 PRINT FILE[1],L$
3720 LET V$="  [MG/M^3] "
3730 IF I0$[2,2]="E" THEN LET V$[9,9]="2"
3740 LET L$="  ID NO.  ",V$,V$,V$[2],V$[2],V$[2],V$[1,10]
3750 PRINT FILE[1],L$
3760 LET V$="   --------"
3770 LET L$=V$[3],V$,"-",V$[2],V$[2],V$[2],V$[2],V$
3780 PRINT FILE[1],L$

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                          PAGE 10
                       PROGRAM LISTING FOR UVV0.C3

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
3790 LET V$=" ----#.### "
3800 LET L$=" ######## ",V$,V$,V$[2],V$[2],V$[2],"-----#.###"
3810 LET L0=L0+6
3820 LET F5=1
3830 RETURN
3840 REM   [BIOMASS DATA SECONDARY HDG.]
3850 LET L$="  SAMPLE       BIOMASS       AUTOTROPHIC INDEX"
3860 IF I0$[3,3]="A" THEN LET L$=L$,"       AUTOTROPHIC INDEX"
3870 PRINT FILE[1],L$
3880 LET V$="[G/M^3]"
3890 IF I0$[2,2]="E" THEN LET V$[6,6]="2"
3900 LET L$="  ID NO.       ",V$,"     (SAMPLE UNACIDIFIED)"
3910 IF I0$[3,3]="A" THEN LET L$=L$,"     (SAMPLE ACIDIFIED)"
3920 PRINT FILE[1],L$
3930 LET L$=" --------    ---------    --------------------"
3940 IF I0$[3,3]="A" THEN LET L$=L$,"     ------------------"
3950 PRINT FILE[1],L$
3960 LET L$=" ########    ----#.###          ----#.####"
3970 IF I0$[3,3]="A" THEN LET L$=L$,B$[1,14],"----#.####"
3980 LET L0=L0+5
3990 LET F5=1
4000 RETURN

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                       PAGE 11
                        SYMBOL TABLE FOR UVV0.C3

SYMBOL    REFERENCES
------  ----------------------------------------------------------------
 0310   0160
 0360   0300
 0600   0690
 0670   0600
 0740   0650  0660
 0920   0940
 1000   0970
 1010   0990
 1070   1020
 1090   0820
 1160   1100
 1200   1150
 1230   1250
 1370   1320
 1470   1410
 1510   1460
 1530   1550
 1670   1620
 1710   1380  2240
 1740   1850
 1820   1740
 1870   1810
 1900   1940  2000  2020
 1960   1920
 1980   1950
 2010   1970  2030
 2050   1810
 2070   2190
 2100   2120  2150
 2160   2070
 2210   1870  1910  2050  2110
 2270   0480  0500  0800  0810  0870  0880  1050  1060  1130  1140
        1180  1190  1350  1360  1440  1450  1490  1500  1650  1660
        1720  1810
 2410   0790  1040  1120  1340  1430  1640
 3000   2420
 3250   0860  1170  1480  3190
 3330   3280
 3490   3450
 3540   3500
 3660   3280
 3850   3280
 A$     0200  0620  0640  0650  0660  0820  1780  1800  1810
 B      1560  1590  1600
 B$     0200  0260  2140  2450  2470  2490  2510  2530  2550  2570
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                       PAGE 12
                        SYMBOL TABLE FOR UVV0.C3

SYMBOL    REFERENCES
------  ----------------------------------------------------------------
        2600  2760  2800  2850  2910  2940  3040  3060  3080  3110
        3660  3690  3700  3970
 D$     0200  2650  2660  2710  3150
 D1     0570  2780
 D2     0570  2780
 D3     0570  2770  2780
 E      0570  2860
 F0$    0210  0330  0360  0370  0510  0520  0750  0760  2300  2310
 F1$    0210  0330  0380  0450  0470  2320
 F2$    0210  0330  0390  0450  0460  2330
 F3$    0210  0330  0400  0460  0470  2340  2360
 F4     0170  0340  0480
 F5     0780  0810  0850  0880  1030  1060  1110  1140  1160  1190
        1330  1360  1420  1450  1470  1500  1630  1660  2980  3180
        3200  3630  3820  3990
 FL#0   0370  0380  0390  0400  0410  0420  0430  2310  2320  2330
        2340
 FL#1   0770  0980  1000  1300  1880  1900  2010  2060  2100  2430
        2440  2460  2480  2500  2520  2540  2560  2580  2590  2720
        2730  2740  2780  2830  2860  2920  2950  3000  3020  3050
        3070  3090  3100  3160  3210  3260  3270  3350  3390  3540
        3580  3680  3710  3750  3780  3870  3920  3950
 FL#3   0520  0530  0540  0550  0560  0570  0580
 FL#4   0760  0890  0930  0950  0960  1200  1240  1260  1270  1540
        1560  1570  1580
 FL#7   2080  2140
 H0     0840  1090  1400  3280  3300
 H[     0240  1260  1270  1300  1570  1580
 I      0250  0260  0270  0910  1070  1220  1370  1520  1670  1890
        1930  1940  1960
 I0$    0220  0560  0970  1290  1380  1590  1600  2810  2820  2880
        2890  2900  3340  3370  3380  3410  3430  3450  3470  3480
        3500  3510  3520  3570  3610  3730  3860  3890  3910  3940
        3970
 J      0920  0930  0950  0960  1230  1240  1260  1270  1530  1540
        1560  1570  1580
 K      3010  3030
 L      0570  2920
 L$     0200  0980  1000  1300  1590  1600  1900  1920  1970  1980
        1990  2010  2020  2100  2120  2130  2140  2450  2460  2470
        2480  2490  2500  2510  2520  2530  2540  2550  2560  2570
        2580  2600  2680  2690  2700  2710  2720  2750  2760  2780
        2790  2800  2810  2820  2830  2840  2850  2860  2870  2880
        2890  2900  2910  2920  2930  2940  2950  3040  3050  3060
        3070  3080  3090  3110  3120  3130  3140  3150  3160  3330
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                       PAGE 13
                        SYMBOL TABLE FOR UVVO.C3

SYMBOL   REFERENCES
------   -----------------------------------------------------------------
         3340  3350  3360  3370  3380  3390  3400  3410  3490  3510
         3520  3530  3540  3560  3570  3580  3600  3610  3660  3670
         3680  3690  3700  3710  3740  3750  3770  3780  3800  3850
         3860  3870  3900  3910  3920  3930  3940  3950  3960  3970
 L0      1010  1020  1100  1310  1320  1410  1610  1620  2960  3010
         3170  3620  3810  3980
 L1      0280  1020  1100  1320  1410  1620
 L2      0290  3010
 M       0930  0940  0950  0960  1240  1250  1260  1270  1540  1550
         1560  1570  1580
 M1      2610  2620  2680  3120
 M2      2630  2660  2670  2690  3130
 M3      2640  2700  2710  3140  3150
 N1$     0230  0410  2780
 N2$     0230  0420  2930
 O[      0240  0960  0980  1000
 P       0740  2420  2970  3050  3220
 P0      0930  1240  1540
 P1      0900  0920  0930  1210  1230  1240  1510  1530  1540
 R1$     0220  0530  2790
 R2$     0220  0540  2860
 R3$     0220  0550  2940
 R[      0240
 S$      0930  0980  1000  1240  1300  1540  1590  1600
 S0      0890  0910  1200  1220  1520
 S1      0890  1200
 U[      0240  1570  1580  1590  1600
 V       0950  0980  1000  1560
 V$      0200  3420  3430  3440  3460  3470  3480  3540  3550  3560
         3570  3590  3600  3610  3720  3730  3740  3760  3770  3790
         3800  3880  3890  3900
 W$      0200  1900  1980  2010  2100  2130
 X       1280  1290  1300  1560  1570  1580
 Y       1560  1570  1580
```

CHLOROPHYLL ANALYSIS INTERMEDIATE SAMPLE REPORT MODULE -- UVVO.C4

Because UVVO.C4 uses many of the same variables used by UVVO.C3, the variable descriptions for this module may be found in Table 18.

UVVO.C4 is chained to from either the automated or manual chlorophyll sample analysis module (UVVO.C2 or UVVO.C5). Parameters are retrieved from the system status transfer file and the chlorophyll run-parameters file. Also, replicate statistics for the sample being analyzed are transferred from the data summary file into a matrix.

The report list file UVVLPT is opened and the preparation begins. A heading is created, followed by segments of information for raw data, sample results, and biomass results, if measured. For each information segment, the module prepares facts pertaining to each replicate, as well as means, standard deviations, and percent relative standard deviations, taken from the matrix mentioned above.

Once the report has been prepared, the module offers options to request terminal output, to request lineprinter output, and to continue the analysis routine. When the latter option is chosen, the module writes the modified program location variables to the system status transfer file, and chains back to the chained-from program.

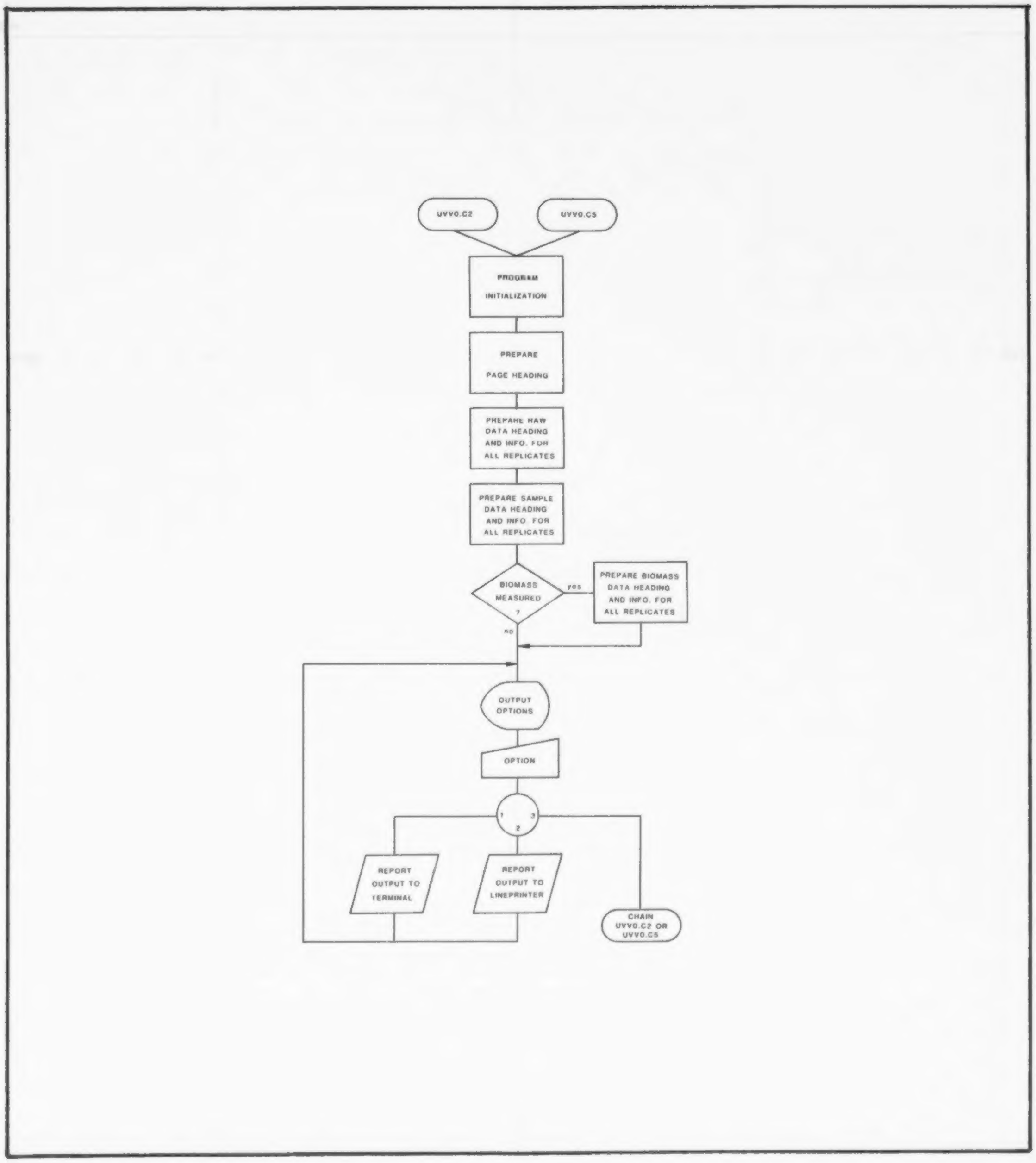

UVV0.C2
UVV0.C5
PROGRAM INITIALIZATION
PREPARE PAGE HEADING
PREPARE RAW DATA HEADING AND INFO. FOR ALL REPLICATES
PREPARE SAMPLE DATA HEADING AND INFO. FOR ALL REPLICATES
BIOMASS MEASURED ?
yes
no
PREPARE BIOMASS DATA HEADING AND INFO. FOR ALL REPLICATES
OUTPUT OPTIONS
OPTION
1
2
3
REPORT OUTPUT TO TERMINAL
REPORT OUTPUT TO LINEPRINTER
CHAIN UVV0.C2 OR UVV0.C5

Figure 14. Flowchart of module UVV0.C4.

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/4/1980                                                          PAGE  1
                     PROGRAM LISTING FOR UVVO.C4

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0010 REM            ++++++++++++++++++++++++++++++++++++++
0020 REM            +   AUTOMATED  ULTRAVIOLET-VISIBLE   +
0030 REM            +      SPECTROPHOTOMETER SYSTEM      +
0040 REM            +  CHLOROPHYLL ANALYSIS INTERMEDIATE +
0050 REM            +   SAMPLE REPORT MODULE:  UVVO.C4   +
0060 REM            +   WRITTEN BY GREG ROTH (4/11/80)   +
0070 REM            +   UNIV. OF CINCI. COMPUTER CENTER  +
0080 REM            ++++++++++++++++++++++++++++++++++++++
0090 REM
0100 REM
0110 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0120 REM                   PROGRAM INITIALIZATION
0130 REM
0140 REM ----------  SET PAGE/ESC/ROUTE-FLAG
0150 PAGE =72
0160 ON ESC THEN GOTO 0290
0170 LET F4=0
0180 ESC
0190 REM ----------  DIM/INIT STRINGS, ARRAYS
0200 DIM L$[72],V$[12],A$[1],B$[40]
0210 DIM F0$[13],F1$[13],F2$[13],F3$[13]
0220 DIM R1$[18],R2$[18],R3$[20]
0230 DIM N1$[20],N2$[20],I0$[6]
0240 DIM O[6],H[8],R[4],U[2],P[10,7]
0250 FOR I=1 TO 40
0260   LET B$[I,I]=" "
0270 NEXT I
0280 GOTO 0340
0290 NOESC
0300 CLOSE
0310 LET F4=1
0320 DIM F0$[13],F1$[13],F2$[13],. 3$[13]
0330 REM ----------  RETRIEVE SYSTEM STATUS PARMS.
0340 LET F0$="UVV00.TR"
0350 OPEN FILE[0,0],F0$,21
0360 READ FILE[0,1],F1$
0370 READ FILE[0,2],F2$
0380 READ FILE[0,3],F3$
0390 READ FILE[0,4],N1$
0400 READ FILE[0,5],N2$
0410 CLOSE FILE[0]
0420 REM   [MODIFY PROGRAM LOCATION VARS.]

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/4/1980                                                          PAGE  2
                     PROGRAM LISTING FOR UVVO.C4

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0430 LET F1$=F2$
0440 LET F2$=F3$
0450 LET F3$=F1$
0460 IF F4=1 THEN GOTO 3020
0470 REM ----------  RETRIEVE CHLOROPHYLL RUN PARMS.
0480 ON ESC THEN GOTO 3020
0490 LET F0$="UVV0C.RP"
0500 OPEN FILE[3,0],F0$,21
0510 READ FILE[3,0],R1$
0520 READ FILE[3,1],R2$
0530 READ FILE[3,2],R3$
0540 READ FILE[3,3],I0$
0550 READ FILE[3,4],E,L
0560 CLOSE FILE[3]
0570 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0580 REM              INTERMEDIATE SAMPLE REPORT PREPARATION
0590 REM
0600 LET F0$="UVV0C.DS"
0610 OPEN FILE[4,0],F0$,32
0620 OPEN FILE[7,1],"UVVLPT"
0630 READ FILE[4,0],S0,S1
0640 READ FILE[4,S1],M,P0,P1,S$,D
0650 REM ----------  RETRIEVE MEANS, STD.DEVS. DATA
0660 FOR I=1 TO 10
0670   READ FILE[4,S1+I],M,P[I,1],P[I,2],P[I,3],P[I,4],P[I,5],P[I,6],P
*      [I,7]
0680 NEXT I
0690 LET L$="<<<<<<<<<<<<  UVVIS  INTERMEDIATE  "
0700 LET L$=L$,"CHLOROPHYLL  COMPUTATION  >>>>>>>>>>>>"
0710 PRINT FILE[7]
0720 PRINT FILE[7],L$
0730 PRINT FILE[7]
0740 LET L$=B$[1,19],"(DATE/TIME:  "
0750 LET Y=SYS(3)
0760 LET W=SYS(11)
0770 LET X=SYS(12)
0780 LET V$="A.M."
0790 IF W>=12 THEN LET V$[1,1]="P"
0800 LET W=W-INT(W/13)*12
0810 LET Y=Y-INT(Y/100)*100
0820 LET L$=L$,STR$(SYS(2)),"/",STR$(SYS(1)),"/"
0830 LET L$=L$,STR$(Y),"  ",STR$(W),":"

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVV0.C4

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0840 IF X<10 THEN LET L$=L$,"0"
0850 LET L$=L$,STR$(X)," ####)"
0860 PRINT FILE[7],USING L$,V$
0870 PRINT FILE[7]
0880 LET L$="ANALYST: ",N1$
0890 LET L$=L$,B$[1,43-LEN(L$)],"SAMPLE ID: ",S$
0900 PRINT FILE[7],L$
0910 LET L$="STATION/STUDY: ",R1$
0920 LET L$=L$,B$[1,43-LEN(L$)],"SAMPLE TYPE: "
0930 IF IO$[2,2]="P" THEN LET L$=L$,"PLANKTON"
0940 IF IO$[2,2]="E" THEN LET L$=L$,"PERIPHYTON"
0950 PRINT FILE[7],L$
0960 LET L$="EXTRACTION METHOD: ####################"
0970 LET L$=L$,B$[1,43-LEN(L$)],"EXTRACT VOLUME: ####.## ML"
0980 PRINT FILE[7],USING L$,R2$,E
0990 LET L$="COMPUTATION METHOD: "
1000 IF IO$[6,6]="U" THEN LET L$=L$,"UNESCO"
1010 IF IO$[6,6]="S" THEN LET L$=L$,"STRICKLAND-PARSONS"
1020 IF IO$[6,6]="J" THEN LET L$=L$,"JEFFREY-HUMPHREY"
1030 LET L$=L$,B$[1,43-LEN(L$)],"CELL PATH LENGTH: ##.## CM"
1040 PRINT FILE[7],USING L$,L
1050 LET L$="INSTRUMENT: ####################"
1060 LET L$=L$,B$[1,43-LEN(L$)],"DILUTION FACTOR: ###.###"
1070 PRINT FILE[7],USING L$,N2$,D
1080 PRINT FILE[7]
1090 PRINT FILE[7]
1100 LET L$="SAMPLE",B$[1,13],"(BEFORE ACIDIFICATION) "
1110 LET L$=L$,"ABSORB. AT   (AFTER) ABS. AT"
1120 PRINT FILE[7],L$
1130 LET L$=" RAW      VOLUME   "
1140 IF IO$[2,2]="E" THEN LET L$[11,16]=" AREA "
1150 LET L$=L$,"------------------------------   -------------"
1160 PRINT FILE[7],L$
1170 LET X=645
1180 IF IO$[6,6]="J" THEN LET X=647
1190 LET Y=663
1200 IF IO$[6,6]="S" THEN LET Y=665
1210 IF IO$[6,6]="J" THEN LET Y=664
1220 LET L$=" DATA    [LITERS]  630 NM   "
1230 IF IO$[2,2]="E" THEN LET L$[10,17]=" [M^2]  "
1240 LET L$=L$,STR$(X)," NM   ",STR$(Y)," NM   750 NM"
1250 LET L$=L$,"   665 NM   750 NM"

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVV0.C4

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
 1260 IF IO$[4,4]="M" THEN GOTO 1300
 1270 LET V$=" PEAK "
 1280 LET L$[38,43]=V$
 1290 LET L$[56,61]=V$
 1300 PRINT FILE[7],L$
 1310 LET L$="-------  --------  ------   ------   ------    "
 1320 LET L$=L$,"------    ------    ------"
 1330 PRINT FILE[7],L$
 1340 LET V$="   -#.###"
 1350 LET L$="##### #  #.##^^^^",V$[2],V$,V$,V$,V$,V$
 1360 LET V$="REPL."
 1370 LET J=S1+10
 1380 FOR I=1 TO P0
 1390   LET J=J+1
 1400   READ FILE[4,J],M,V
 1410   IF M<>2 THEN GOTO 1390
 1420   MAT O=ZER
 1430   READ FILE[4,J+1],M,O[1],O[2],O[3],O[4],O[5],O[6]
 1440   PRINT FILE[7],USING L$,V$,I,V,O[1],O[2],O[3],O[4],O[5],O[6]
 1450 NEXT I
 1460 LET L$[1,7]="MEAN   "
 1470 PRINT FILE[7],USING L$,P[1,1],P[2,1],P[2,2],P[2,3],P[2,4],P[2,5],
*     P[2,6]
 1480 LET V$="   #.####"
 1490 LET L$="#######  #.###^^^^",V$[2],V$,V$,V$,V$,V$
 1500 LET V$="ST. DV."
 1510 PRINT FILE[7],USING L$,V$,P[1,2],P[3,1],P[3,2],P[3,3],P[3,4],P[3,
*     5],P[3,6]
 1520 LET V$=" ---#.###"
 1530 LET L$="%REL SD",V$,V$,V$,V$,V$,V$,V$
 1540 PRINT FILE[7],USING L$,P[1,3],P[4,1],P[4,2],P[4,3],P[4,4],P[4,5],
*     P[4,6]
 1550 PRINT FILE[7]
 1560 LET L$="SAMPLE      CHL-A      CHL-B      CHL-C    TOTAL CHL"
 1570 LET L$=L$,"  RATIO    RATIO"
 1580 PRINT FILE[7],L$
 1590 LET V$=" [MG/M^3]  "
 1600 IF IO$[2,2]="E" THEN LET V$[8,8]="2"
 1610 LET L$="UNCORR.   ",V$,V$,V$,V$,"CHL-A/B  CHL-A/C"
 1620 PRINT FILE[7],L$
 1630 LET V$="---------  "
 1640 LET L$="-------   ",V$,V$,V$,V$,"-------  -------"

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVVO.C4

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
1650 PRINT FILE[7],L$
1660 LET V$="  ----#.###"
1670 LET L$="##### #",V$,V$,V$," -----#.###  ---#.##  ---#.##"
1680 LET V$="REPL."
1690 LET J=S1+10
1700 FOR I=1 TO PO
1710   LET J=J+1
1720   READ FILE[4,J],M
1730   IF M<>2 THEN GOTO 1710
1740   READ FILE[4,J+2],M,H[1],H[2],H[3],H[4],R[1],R[2]
1750   PRINT FILE[7],USING L$,V$,I,H[1],H[2],H[3],H[4],R[1],R[2]
1760 NEXT I
1770 LET L$[1,7]="MEAN   "
1780 PRINT FILE[7],USING L$,P[5,1],P[5,2],P[5,3],P[5,4],P[5,5],P[5,6]
1790 LET V$="  ###.#### "
1800 LET L$="#######  ",V$,V$,V$,V$,"  ##.###   ##.###"
1810 LET V$="ST. DV."
1820 PRINT FILE[7],USING L$,V$,P[6,1],P[6,2],P[6,3],P[6,4],P[6,5],P[6,
*     6]
1830 LET V$=" ---#.##   "
1840 LET L$="%REL SD  ",V$,V$,V$,V$,V$[2,10],V$[2,8]
1850 PRINT FILE[7],USING L$,P[7,1],P[7,2],P[7,3],P[7,4],P[7,5],P[7,6]
1860 IF IO$[3,3]="N" THEN GOTO 2200
1870 PRINT FILE[7]
1880 LET L$="SAMPLE    UNCOR/COR    PHEO-A     CHL-A"
1890 LET L$=L$,"    TOTAL CHL   RATIO    RATIO"
1900 PRINT FILE[7],L$
1910 LET V$=" [MG/M^3]  "
1920 IF IO$[2,2]="E" THEN LET V$[8,8]="2"
1930 LET L$=" CORR.    ABS RATIO  ",V$,V$,V$
1940 LET L$=L$,"CHL-A/B  CHL-A/C"
1950 PRINT FILE[7],L$
1960 LET V$="---------  "
1970 LET L$="-------    ",V$,V$,V$,V$,V$[3,11],V$[3,9]
1980 PRINT FILE[7],L$
1990 LET V$="-----#.###  "
2000 LET L$="##### #  ",V$,V$,V$[1,10],"-----#.###  ---#.##  ---#.##"
2010 LET V$="REPL."
2020 LET J=S1+10
2030 FOR I=1 TO PO
2040   LET J=J+1
2050   READ FILE[4,J],M

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVVO.C4

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2060   IF M<>2 THEN GOTO 2040
2070   READ FILE[4,J+3],M,H[5],H[6],H[7],H[8],R[3],R[4]
2080   PRINT FILE[7],USING L$,V$,I,H[5],H[7],H[6],H[8],R[3],R[4]
2090 NEXT I
2100 LET L$[1,7]="MEAN   "
2110 PRINT FILE[7],USING L$,P[8,1],P[8,3],P[8,2],P[8,4],P[8,5],P[8,6]
2120 LET V$="  ###.#### "
2130 LET L$="#######  ",V$,V$,V$,V$,"  ##.###   ##.###"
2140 LET V$="ST. DV."
2150 PRINT FILE[7],USING L$,V$,P[9,1],P[9,3],P[9,2],P[9,4],P[9,5],P[9,
*     6]
2160 LET V$=" ---#.##   "
2170 LET L$="%REL SD  ",V$,V$,V$,V$,V$[2,10],V$[2,8]
2180 PRINT FILE[7],USING L$,P[10,1],P[10,3],P[10,2],P[10,4],P[10,5],P[
*     10,6]
2190 PRINT FILE[7]
2200 IF IO$[5,5]="I" THEN GOTO 2520
2210 LET L$=B$[1,13],"BIOMASS     AUTOTROPHIC INDEX"
2220 LET L$=L$,"      AUTOTROPHIC INDEX"
2230 PRINT FILE[7],L$
2240 LET L$="REPLICATE    [G/M^3]    "
2250 IF IO$[2,2]="E" THEN LET L$[19,19]="2"
2260 LET L$=L$,"(SAMPLE UNACIDIFIED)   (SAMPLE ACIDIFIED)"
2270 PRINT FILE[7],L$
2280 LET L$="---------   --------   --------------------"
2290 LET L$=L$,"   -------------------"
2300 PRINT FILE[7],L$
2310 LET L$=" ##### #     -----#.###        -----#.####"
2320 LET L$=L$,B$[1,12],"-----#.####"
2330 LET V$="REPL."
2340 LET J=S1+10
2350 FOR I=1 TO PO
2360   LET J=J+1
2370   READ FILE[4,J],M,V,B
2380   IF M<>2 THEN GOTO 2360
2390   READ FILE[4,J+2],M,H[1],H[2],H[3],H[4],R[1],R[2],U[1]
2400   READ FILE[4,J+3],M,H[5],H[6],H[7],H[8],R[3],R[4],U[2]
2410   PRINT FILE[7],USING L$,V$,I,B,U[1],U[2]
2420 NEXT I
2430 LET L$[2,8]="MEAN   "
2440 PRINT FILE[7],USING L$,P[1,4],P[5,7],P[8,7]
2450 LET L$=" STND DEV    ####.###        ####.####"

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/4/1980                                                 PAGE  7
                  PROGRAM LISTING FOR UVV0.C4

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2460 LET L$=L$,B$[1,13],"####.####"
2470 PRINT FILE[7],USING L$,P[1,5],P[6,7],P[9,7]
2480 LET V$="%REL S.D."
2490 LET L$=" ##########   --#.##"
2500 LET L$=L$,"           ---#.###",B$[1,14],"---#.###"
2510 PRINT FILE[7],USING L$,V$,P[1,6],P[7,7],P[10,7]
2520 CLOSE FILE[7]
2530 CLOSE FILE[4]
2540 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
2550 REM                       REPORT OUTPUT
2560 REM
2570 ON ESC THEN GOTO 3020
2580 ESC
2590 ON ERR THEN GOTO 2680
2600 PRINT
2610 PRINT "SAMPLE REPORT: TERMINAL[1], LINEPRINTER[2], ";
2620 INPUT "CONTINUE[3(CR)]  >>> ",A$
2630 ON ERR THEN STOP
2640 IF LEN(A$)=0 THEN LET A$="3"
2650 LET P=POS("123",A$,1)
2660 ON P THEN GOTO 2720, 2800, 3020
2670 ON ERR THEN STOP
2680 PRINT "<7>"
2690 PRINT "PLEASE ENTER 1, 2, OR 3(CR)."
2700 GOTO 2590
2710 REM ----------  TERMINAL REPORT
2720 ON ESC THEN GOTO 2900
2730 OPEN FILE[7,3],"UVVLPT"
2740 LREAD FILE[7],L$,V$
2750 IF EOF(7)=1 THEN GOTO 2900
2760 LET L$=L$,V$
2770 PRINT L$;
2780 GOTO 2740
2790 REM ----------  LINEPRINTER REPORT
2800 ON ESC THEN GOTO 2900
2810 OPEN FILE[7,3],"UVVLPT"
2820 ON ERR THEN GOTO 2940
2830 OPEN FILE[1,1],"$LPT"
2840 ON ERR THEN STOP
2850 LREAD FILE[7],L$,V$
2860 IF EOF(7)=1 THEN GOTO 2900
2870 PRINT FILE[1],B$[1,4];L$

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/4/1980                                                 PAGE  8
                  PROGRAM LISTING FOR UVV0.C4

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2880 GOTO 2850
2890 REM   [ESC FROM REPORTING]
2900 NOESC
2910 CLOSE
2920 GOTO 2570
2930 REM   [LINEPRINTER FILE OPEN; DELAY]
2940 CLOSE
2950 ON ESC THEN GOTO 2570
2960 PRINT "<7>"
2970 PRINT "LINEPRINTER IN USE; WILL DELAY 10 SECS. AND RETRY."
2980 DELAY =9
2990 GOTO 2800
3000 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
3010 REM               SAMPLE ANALYSIS RETURN POINT
3020 NOESC
3030 CLOSE
3040 LET F0$="UVV00.TR"
3050 OPEN FILE[0,0],F0$,21
3060 WRITE FILE[0,1],F1$
3070 WRITE FILE[0,2],F2$
3080 WRITE FILE[0,3],F3$
3090 CLOSE FILE[0]
3100 CHAIN F3$

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/4/1980                                                      PAGE  9
                      SYMBOL TABLE FOR UVVO.C4

SYMBOL   REFERENCES
------   -------------------------------------------------------------
 0290    0160
 0340    0280
 1300    1260
 1390    1410
 1710    1730
 2040    2060
 2200    1860
 2360    2380
 2520    2200
 2570    2920  2950
 2590    2700
 2680    2590
 2720    2660
 2740    2780
 2800    2660  2990
 2850    2880
 2900    2720  2750  2800  2860
 2940    2820
 3020    0460  0480  2570  2660
 A$      0200  2620  2640  2650
 B       2370  2410
 B$      0200  0260  0740  0890  0920  0970  1030  1060  1100  2210
         2320  2460  2500  2870
 D       0640  1070
 E       0550  0980
 F0$     0210  0320  0340  0350  0490  0500  0600  0610  3040  3050
 F1$     0210  0320  0360  0430  0450  3060
 F2$     0210  0320  0370  0430  0440  3070
 F3$     0210  0320  0380  0440  0450  3080  3100
 F4      0170  0310  0460
 FL#0    0350  0360  0370  0380  0390  0400  0410  3050  3060  3070
         3080  3090
 FL#1    2830  2870
 FL#3    0500  0510  0520  0530  0540  0550  0560
 FL#4    0610  0630  0640  0670  1400  1430  1720  1740  2050  2070
         2370  2390  2400  2530
 FL#7    0620  0710  0720  0730  0860  0870  0900  0950  0980  1040
         1070  1080  1090  1120  1160  1300  1330  1440  1470  1510
         1540  1550  1580  1620  1650  1750  1780  1820  1850  1870
         1900  1950  1980  2080  2110  2150  2180  2190  2230  2270
         2300  2410  2440  2470  2510  2520  2730  2740  2810  2850
 H[      0240  1740  1750  2070  2080  2390  2400
 I       0250  0260  0270  0660  0670  0680  1380  1440  1450  1700
         1750  1760  2030  2080  2090  2350  2410  2420
 I0$     0230  0540  0930  0940  1000  1010  1020  1140  1180  1200
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/4/1980                                                      PAGE 10
                      SYMBOL TABLE FOR UVVO.C4

SYMBOL   REFERENCES
------   -------------------------------------------------------------
         1210  1230  1260  1600  1860  1920  2200  2250
 J       1370  1390  1400  1430  1690  1710  1720  1740  2020  2040
         2050  2070  2340  2360  2370  2390  2400
 L       0550  1040
 L$      0200  0690  0700  0720  0740  0820  0830  0840  0850  0860
         0880  0890  0900  0910  0920  0930  0940  0950  0960  0970
         0980  0990  1000  1010  1020  1030  1040  1050  1060  1070
         1100  1110  1120  1130  1140  1150  1160  1220  1230  1240
         1250  1280  1290  1300  1310  1320  1330  1350  1440  1460
         1470  1490  1510  1530  1540  1560  1570  1580  1610  1620
         1640  1650  1670  1750  1770  1780  1800  1820  1840  1850
         1880  1890  1900  1930  1940  1950  1970  1980  2000  2080
         2100  2110  2130  2150  2170  2180  2210  2220  2230  2240
         2250  2260  2270  2280  2290  2300  2310  2320  2410  2430
         2440  2450  2460  2470  2490  2500  2510  2740  2760  2770
         2850  2870
 M       0640  0670  1400  1410  1430  1720  1730  1740  2050  2060
         2070  2370  2380  2390  2400
 N1$     0230  0390  0880
 N2$     0230  0400  1070
 O       1420
 O[      0240  1430  1440
 P       2650  2660
 P0      0640  1380  1700  2030  2350
 P1      0640
 P[      0240  0670  1470  1510  1540  1780  1820  1850  2110  2150
         2180  2440  2470  2510
 R1$     0220  0510  0910
 R2$     0220  0520  0980
 R3$     0220  0530
 R[      0240  1740  1750  2070  2080  2390  2400
 S$      0640  0890
 S0      0630
 S1      0630  0640  0670  1370  1690  2020  2340
 U[      0240  2390  2400  2410
 V       1400  1440  2370
 V$      0200  0780  0790  0860  1270  1280  1290  1340  1350  1360
         1440  1480  1490  1500  1510  1520  1530  1590  1600  1610
         1630  1640  1660  1670  1680  1750  1790  1800  1810  1820
         1830  1840  1910  1920  1930  1960  1970  1990  2000  2010
         2080  2120  2130  2140  2150  2160  2170  2330  2410  2480
         2510  2740  2760  2850
 W       0760  0790  0800  0830
 X       0770  0840  0850  1170  1180  1200  1210  1240
 Y       0750  0810  0830  1190  1240
```

FILE STRUCTURES

The chlorophyll analysis modules use and/or create nine files. Three of them are described below. One of them is the plot reference file, which is also more fully formatted in Table 8. Its corresponding plot data file is displayed in Table 7. Three more files and their descriptive Tables are: 1) the system status transfer file UVV00.TR, shown in Table 2; 2) the wavelength calibration file UVV00.CF, shown in Table 3; and 3) the chlorophyll analysis transmittance calibration file UVV0C.CF, shown in Table 5. The remaining two files are UVVLPT, which stores up reports for terminal or lineprinter output, and $LPT, the list file associated with the lineprinter device.

TABLE 19. STRUCTURE OF THE CHLOROPHYLL RUN-PARAMETERS FILE

File name: UVVOC.RP

File type: fixed-length binary random access

Record length: 21 bytes

File number: 3

Record	File Content
0	R1$
1	R2$
2	R3$
3	I1$
4	E,LO,M1,M2,M3

Where:

R1$ is the station or study
R2$ is the extraction method
R3$ is a comment for the run
I1$ is a string of chlorophyll run-parameter flags
E is the extract volume (mL.)
LO is the cell path length (cm.)
M1,M2,M3 are the month, day and year of the analysis

Note: I1$ is broken down in the following manner:

Character	Flag	Definitions
1	sample-run	"S" for start of run ** "M" for mid-run
2	sample-type	"P" for plankton ** "E" for periphyton
3	acidification	"A" for unacidified and acidified scans ** "N" for unacidified scan only
4	peak	"M" for method peak ** "F" for found peak
5	biomass	"I" for biomass ignored ** "K" for biomass known
6	computation-method	"U" for UNESCO ** "S" for Strickland-Parsons "J" for Jeffrey-Humphrey
7*	data-entry	"A" for absorbance input ** "T" for % transmittance input

* Data-entry flag used only in manual analysis modules.
** These definitions are original default settings only.

TABLE 20. STRUCTURE OF THE CHLOROPHYLL ANALYSIS DATA SUMMARY FILE

File name: UVVOC.DS

File type: fixed-length binary random access

Record length: 32 bytes

File number: 4

Record	File content
0	SO,S1
1	M,PO,P1,S\$,$\underline{D}$
2	$M',\bar{V},S_{\bar{V}},R_{\bar{V}},\bar{B},S_{\bar{B}},R_{\bar{B}}$
3	M', means of corresponding raw data (e.g. record #13)
4	M', standard deviations (SD's) of raw data means
5	M', percent relative SD's of raw data means
6	M', means of corresponding unacidified data (e.g. record #14)
7	M', standard deviations (SD's) of unacidified data means
8	M', percent relative SD's of unacidified data means
9	M', means of corresponding acidified data (e.g. record #15)
10	M', standard deviations (SD's) of acidified data means
11	M', percent relative SD's of acidified data
12	M", V,B
13	$M',O_1,O_2,O_3,O_4,O_5,O_6,$
14	$M',H_1,H_2,H_3,H_4,R_1,R_2,U_1$
15	$M',H_5,H_6,H_7,H_8,R_3,R_4,U_2$
16	M",V,B
.	. . . .
.	. . . .
.	. . . .
.	. . . .
etc.	etc. etc. etc. etc.

Where:

SO is sample counter
S1 is sample pointer
M is marker of a filter header record
PO is replicate counter
P1 is replicate pointer
S\$ is sample identifier
$\underline{D}$ is dilution factor
$\bar{V}$ is mean sample vol./area
$S_{\bar{V}}$ is standard deviation of mean sample vol./area
$R_{\bar{V}}$ is percent relative S_V

$\bar{B}$ is mean biomass
$S_{\bar{B}}$ is standard deviation of mean biomass
$R_{\bar{B}}$ is percent relative S_B
M' (=0) is marker of a normal data record
M" is marker of a replicate header record
V is sample vol./area of a replicate
B is replicate biomass
O1-O6 are raw data; see Table 17 variables O(1), ,O(6)
H_1-H_4,R_1,R_2,U_1 are unacidified data; see Table 17 variables H(1),...,H(4),R(1),R(2), and U(1)
H_5-H_8,R_3,R_4,U_2 are acidified data; see Table 17 variables H(5),...,H(8),R(3),R(4), and U(2)

TABLE 21. STRUCTURE OF THE CHLOROPHYLL PLOT REFERENCE FILE

File name: UVVOC.PR

File type: fixed-length binary random access

Record length: 41 bytes

File number: 6

File content

Record formats are detailed in Table 8. The form of the headings defined in that table are, for UVVOC.PR, as follows:

Heading	Form
H0$	"PLANKTON" or "PERIPHYTON"
H1$	"IDENTIFIER: ########"
H2$	"COMMENT: ###################"
H3$	"REPLICATE NUMBER #"
H4$	"NOTE: ACIDIFIED IS DASHED LINE"

Note: # symbol represents an alphanumeric character.

SECTION 7

COLOR ANALYSIS

The automated and manual data-entry color analyses are comprised of seven modules. A pair of modules (UVVO.L1 and UVVO.L2) constitute the majority of the automated analysis. Its manual counterpart is handled by another pair (UVVO.L0 and UVVO.L3). UVVO.L6 completes the update standards analysis function begun in either the automated or manual mode. Reports are prepared by two other modules (UVVO.L4 and UVVO.L5).

One should consult Figure 1 to see the command levels of these modules. It should be mentioned that the manual analysis method differs slightly from that of the automated analysis. It should also be noted that there are separate historical standards files for the automated and manual modules; respectively UVVOL.SF and UVVOL.SM.

AUTOMATED COLOR ANALYSIS MODULE -- UVVO.L1

UVVO.L1 is chained to from UVVO.00 or from any of its called modules (UVVO.TO, UVVO.L2, UVVO.L4, or UVVO.L5). Parameters are retrieved from the system status transfer file, and from the wavelength calibration file. The module then attempts to verify the existence of a proper 30-Selected-Ordinate method file UVVOO.SF. Should the contents of the zeroth record indicate the file's non-existence, then an error message is issued, error arguments are written to the system status transfer file, and a forced chain is made to UVVO.00 via the program exit point.

The transmittance calibration section is like that of UVVO.Q1. For UVVO.L1, however, the transmittance calibration file is UVVOL.CF, while the scan range wavelength bounds are the same.

The scanning mechanism section, being the same for all the main automated analysis modules, is described in the section on the Scanning Mechanism Speed Checking/Setting Routine.

The chlorophyll analysis summary report section handles both the commands for a general summary report and the command for a summary standards report. In the former case, the "destination" program is defined as UVVO.L4, while in the latter case, it is defined as UVVO.L5. Following this definition, the module branches to the program exit point.

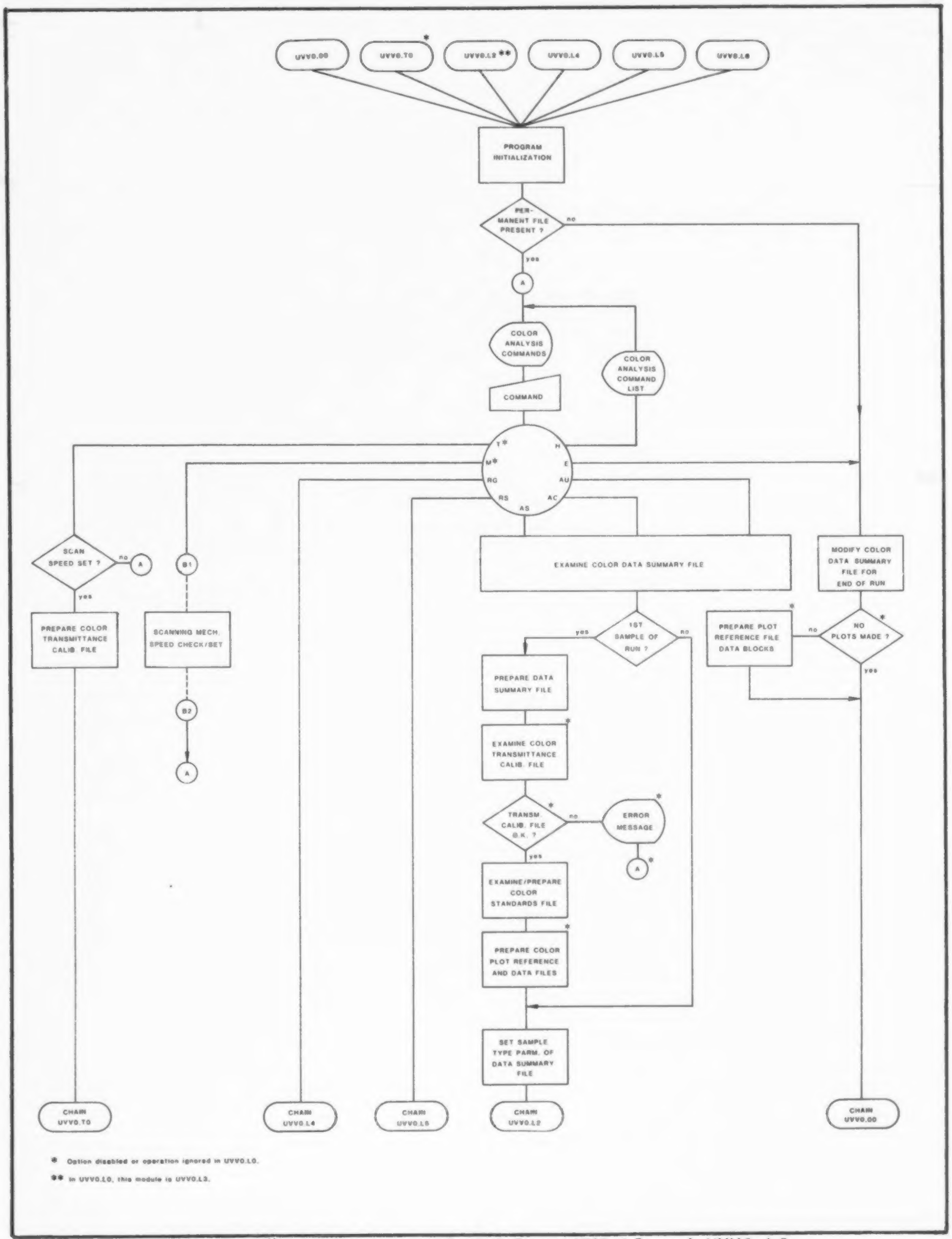
One section of code processes commands for the analysis of update standards, check standards, and unknowns. To begin, the zeroth record of the data summary file is examined in order to determine if this sample analysis command is the first of the run. If it is, then four operations take place. Firstly, the data summary file is initialized by defining the zeroth record. Secondly, the transmittance calibration file is checked. Should it be non-existent or incomplete, the module ceases to process the sample analysis command. Thirdly, if the automated color standards file is yet undefined, then all essential records for that file are initialized. Fourthly, the plot data and plot reference files are established for the beginning of the run.

The module continues to prepare for the sample analysis command by defining the sample-type flag of the data summary file. The "destination" program is then declared to be UVVO.L2, and program control skips to the exit point.

In the chlorophyll analysis ending section, the module inquires of the plot reference file the number of plots prepared. In the automated color analysis session, because update standards may be studied after other types of samples, certain facts for check standards and unknowns are not written to the plot reference file until the analysis session has been completed. Should plots have been made, the data summary file is accessed to aid in defining the plot reference file entries for check standards and unknowns.

The ending section completes its work by writing a zero sample-type to the data summary file to indicate the run's conclusion, and by chaining to UVVO.00 through the program exit point.

At the program exit point, modified program location variables are written to the system status transfer file, and a chain is made to the "destination" program.


UVVO.00
UVVO.T0 *
UVVO.L2 **
UVVO.L4
UVVO.L5
UVVO.L6
PROGRAM INITIALIZATION
PER-MANENT FILE PRESENT ?
no
yes
A
COLOR ANALYSIS COMMANDS
COLOR ANALYSIS COMMAND LIST
COMMAND
T*
H
M*
E
RG
AU
RS
AC
AS
SCAN SPEED SET ?
no
A
yes
PREPARE COLOR TRANSMITTANCE CALIB. FILE
B1
SCANNING MECH. SPEED CHECK/SET
B2
A
EXAMINE COLOR DATA SUMMARY FILE
MODIFY COLOR DATA SUMMARY FILE FOR END OF RUN
1ST SAMPLE OF RUN ?
yes
no
PREPARE PLOT REFERENCE FILE DATA BLOCKS *
NO PLOTS MADE ? *
no
yes
PREPARE DATA SUMMARY FILE
EXAMINE COLOR TRANSMITTANCE CALIB. FILE *
TRANSM CALIB. FILE O.K. ? *
no
yes
ERROR MESSAGE *
A *
EXAMINE/PREPARE COLOR STANDARDS FILE
PREPARE COLOR PLOT REFERENCE AND DATA FILES *
SET SAMPLE TYPE PARM. OF DATA SUMMARY FILE
CHAIN UVVO.T0
CHAIN UVVO.L4
CHAIN UVVO.L5
CHAIN UVVO.L2
CHAIN UVVO.00

* Option disabled or operation ignored in UVVO.L0.

** In UVVO.L0, this module is UVVO.L3.

Figure 15. Flowchart of modules UVVO.L1 and UVVO.L0.

TABLE 22. VARIABLE DESCRIPTIONS FOR MODULES UVV0.L1 and UVV0.L0

A$	a single-character user-response variable
A0$	the color analysis command
A1()	the ADMI values of the six APHA standards
A2*	an accumulator used by CALL 257
C$	the color analysis command line
C0*	a control rating indicator for check standards results
C2*	the CALL 257 indicator number for "scan-clear" (for stop)
C5*	the transmittance signal channel number
C6*	the wavelength signal channel number
C7*	the CALL 7 channel-indicator number
D0*	the measured DE of a check standard or an unknown
D7*	the CALL 7 initial time delay (in sixtieth seconds)
D8*	the CALL 7 between-signal pairs time delay (in sixtieth seconds)
F0	the system status parameter run-mode flag
F1	the system status parameter error flag; see Table 1
F0$	a file name variable
F1$, F2$, F3$	program location variables; see Table 1
F5	a flag used during program initialization
I,I0*,J*	loop-counter and general-purpose variables.
K*	the number of scans (one) of a color plot
L$*	an output and output-format character string
N*	the number of data blocks in the color plot reference file
N1$*,N2$*	the analyst's and instrument's names; and the portions of a comment for an unknown
N7*	the number of A/D counts to be put in the V0 scan array
O0*	for check standards: the expected ADMI value; for unknowns: the number of data summary file records used for a comment for an unknown
O1*	the computed ADMI value
P	a branching variable; in UVV0.L1 only, a plot data file pointer
P0*	a pointer variable for data summary file records
Q1*,Q2*,Q3*	the constants of the wavelength calibration equation
R*	the computed scan speed (in nanometers per minute)
R0*	the expected scan speed (in nanometers per minute)
R$*	an output character string used for control ratings
S$*	the identifier for a check standard or an unknown
S0*	two times the standard deviation of a standards mean DE
S()*	the standard deviations of the standards mean DE's
U()	the mean DEs of the six APHA standards
U1*,U2*,U3*	the constants of the standards curve
V$*	a general-purpose character string
V0()*	the CALL 7 scan array
W*,X*,Y*	general-purpose variables usually representing wavelength
W0*,W1*	the lower and upper scan range wavelength bounds

* Starred variables are used in module UVV0.L1 only.

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE  1
                     PROGRAM LISTING FOR UVV0.L1

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0010 REM          ++++++++++++++++++++++++++++++++++++++++
0020 REM          +    AUTOMATED  ULTRAVIOLET-VISIBLE    +
0030 REM          +       SPECTROPHOTOMETER SYSTEM       +
0040 REM          +       AUTOMATED COLOR ANALYSIS       +
0050 REM          +           MODULE:  UVV0.L1           +
0060 REM          +    WRITTEN BY GREG ROTH (5/30/80)    +
0070 REM          +    UNIV. OF CINCI. COMPUTER CENTER   +
0080 REM          ++++++++++++++++++++++++++++++++++++++++
0090 REM
0100 REM
0110 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0120 REM                  PROGRAM INITIALIZATION
0130 REM
0140 REM ----------  SET PAGE/ESC/ROUTE-FLAG
0150 PAGE =72
0160 ON ESC THEN GOTO 0330
0170 LET F5=0
0180 ESC
0190 REM ----------  DIM/INIT STRING VARS'S AND ARRAYS
0200 DIM F0$[13],F1$[13],F2$[13],F3$[13],A0$[2],A$[1]
0210 DIM S$[8],N1$[20],N2$[20],L$[40],R$[30],C$[18]
0220 DIM V$[5],V0[22],A1[6],U[6],S[6]
0230 LET C$="T M RGRSASACAUE H "
0240 LET R$="IN CONTROLWARNING   OUT OF CTL"
0250 LET A1[1]=25
0260 LET A1[2]=50
0270 LET A1[3]=100
0280 LET A1[4]=150
0290 LET A1[5]=200
0300 LET A1[6]=250
0310 GOTO 0380
0320 REM ----------  ESCAPE DURING PROGRAM INITIALIZATION
0330 NOESC
0340 CLOSE
0350 DIM F0$[13],F1$[13],F2$[13],F3$[13]
0360 LET F5=1
0370 REM ----------  RETRIEVE SYSTEM STATUS PARMS.
0380 LET F0$="UVV00.TR"
0390 OPEN FILE[0,0],F0$,21
0400 READ FILE[0,0],F0,F1
0410 READ FILE[0,1],F1$
0420 READ FILE[0,2],F2$

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE  2
                     PROGRAM LISTING FOR UVV0.L1

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0430 READ FILE[0,3],F3$
0440 READ FILE[0,4],N1$
0450 READ FILE[0,5],N2$
0460 READ FILE[0,6],C5,C6,C7
0470 CLOSE FILE[0]
0480 REM   [MODIFY PROGRAM LOCATION VAR'S]
0490 LET F1$=F2$
0500 LET F2$=F3$
0510 LET F3$=""
0520 IF F5=1 THEN GOTO 3470
0530 REM ---------- RETRIEVE WAVELENGTH CALIBRATION DATA
0540 ON ESC THEN GOTO 3470
0550 LET F0$="UVV00.CF"
0560 OPEN FILE[1,0],F0$,20
0570 READ FILE[1,1],Q1,Q2,Q3
0580 CLOSE FILE[1]
0590 REM ----------  VERIFY EXISTENCE OF 30-SEL-ORD METH. FILE
0600 LET F0$="UVV00.SF"
0610 LET I=0
0620 LET J=0
0630 OPEN FILE[3,0],F0$,8
0640 READ FILE[3,0],I,J
0650 CLOSE FILE[3]
0660 IF (I+J)=1 THEN GOTO 0920
0670 REM   [30-SEL-ORD METH. FILE DOEN'T PROPERLY EXIST]
0680 NOESC
0690 LET F0$="UVV00.TR"
0700 OPEN FILE[0,0],F0$,21
0710 LET F1=1
0720 LET I=-10
0730 WRITE FILE[0,0],F0,F1
0740 WRITE FILE[0,7],SYS(2),SYS(1),SYS(11),SYS(12),I
0750 CLOSE FILE[0]
0760 GOTO 3470
0770 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0780 REM                  COLOR ANALYSIS COMMAND LEVEL
0790 REM
0800 REM ----------  COLOR ANALYSIS COMMAND LIST
0810 ON ESC THEN GOTO 0920
0820 PRINT
0830 PRINT "T  ---  TRANSMITTANCE CALIBRATION; CHECK AND/OR SET"
0840 PRINT "M  ---  SCANNING MECHANISM SPEED; CHECK AND/OR SET"

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                        PAGE  3
                    PROGRAM LISTING FOR UVV0.L1

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0850 PRINT "RG ---  GENERAL SUMMARY REPORT"
0860 PRINT "RS ---  SUMMARY STANDARDS REPORT"
0870 PRINT "AS ---  ANALYSIS OF SET OF UPDATE STANDARDS"
0880 PRINT "AC ---  ANALYSIS OF CHECK STANDARD(S)"
0890 PRINT "AU ---  ANALYSIS OF UNKNOWN(S)"
0900 PRINT "E  ---  END OF COLOR ANALYSIS"
0910 REM ----------  COLOR ANALYSIS COMMAND SELECT
0920 ON ESC THEN GOTO 3470
0930 ESC
0940 ON ERR THEN GOTO 1040
0950 PRINT
0960 PRINT
0970 PRINT "COLOR ANALYSIS COMMANDS:  ";
0980 INPUT "T, M, RG, RS, AS, AC, AU, E, H(CR) >>>  ",A0$
0990 ON ERR THEN STOP
1000 IF LEN(A0$)=0 THEN LET A0$="H "
1010 IF LEN(A0$)=1 THEN LET A0$=A0$," "
1020 LET P=(POS(C$,A0$,1)-1)/2+1
1030 ON P THEN GOTO 1110, 1380, 2490, 2490, 2560, 2560, 2560, 3470, 08
*    10
1040 ON ERR THEN STOP
1050 PRINT "<7>"
1060 PRINT "INVALID COMMAND.";
1070 GOTO 0940
1080 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
1090 REM       TRANSMITTANCE CALIBRATION CHECK/SET SECTION
1100 REM
1110 ON ESC THEN GOTO 1270
1120 LET F0$="UVV0L.CF"
1130 LET R=0
1140 OPEN FILE[2,0],F0$,8
1150 ON ERR THEN GOTO 1300
1160 READ FILE[2,0],I,J
1170 READ FILE[2,1],I,R
1180 ON ERR THEN STOP
1190 IF R<=0 THEN GOTO 1300
1200 LET W1=700
1210 LET W0=400
1220 WRITE FILE[2,2],W1,W0
1230 CLOSE FILE[2]
1240 NOESC
1250 LET F3$="UVV0.T0"

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                        PAGE  4
                    PROGRAM LISTING FOR UVV0.L1

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
1260 GOTO 3950
1270 NOESC
1280 CLOSE
1290 GOTO 0920
1300 NOESC
1310 CLOSE
1320 PRINT "<7>"
1330 PRINT "SCAN MECHANISM SPEED NOT SET OR IMPROPER."
1340 GOTO 0920
1350 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
1360 REM        SCANNING MECH. SPEED CHECK/SET SECTION
1370 REM
1380 ON ESC THEN GOTO 1490
1390 LET D7=0
1400 LET D8=60
1410 LET R=0
1420 LET F0$="UVV0L.CF"
1430 OPEN FILE[2,0],F0$,8
1440 ON ESC THEN GOTO 1490
1450 ON ERR THEN GOTO 1520
1460 READ FILE[2,1],I,R
1470 CLOSE FILE[2]
1480 GOTO 1570
1490 NOESC
1500 CLOSE FILE[2]
1510 GOTO 0920
1520 ON ERR THEN STOP
1530 NOESC
1540 LET R=0
1550 CLOSE FILE[2]
1560 REM ----------  SCANNING MECH. SPEED OPTION-SELECT
1570 ON ESC THEN GOTO 0920
1580 ESC
1590 ON ERR THEN GOTO 1670
1600 PRINT
1610 PRINT "SCAN MECH. SPEED:  ";
1620 INPUT "CHECK[1], SET[2], OR CONTINUE[3(CR)]  >>> ",A$
1630 ON ERR THEN STOP
1640 IF LEN(A$)=0 THEN LET A$="3"
1650 LET P=POS("123",A$,1)
1660 ON P THEN GOTO 1720, 1720, 0920
1670 ON ERR THEN STOP

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVV0.L1

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
1680 PRINT "<7>"
1690 PRINT "PLEASE ENTER 1, 2, OR 3(CR)"
1700 GOTO 1590
1710 REM ----------  SCAN MECH. SPEED CHECK/SET INSTRS.
1720 ON ESC THEN GOTO 2330
1730 LET V$="CHECK"
1740 IF P=2 THEN LET V$="SET"
1750 PRINT
1760 PRINT "SCANNING MECHANISM SPEED ";V$;":"
1770 PRINT  TAB(10);"1.  SET WAVELENGTH AT SCANNING MID-RANGE."
1780 PRINT  TAB(10);"2.  SET SPECTRO. FOR SCAN OPERATION AND ";
1790 ON ERR THEN GOTO 1830
1800 INPUT "PRESS CR KEY. ",A$
1810 ON ERR THEN STOP
1820 IF LEN(A$)=0 THEN GOTO 1870
1830 ON ERR THEN STOP
1840 PRINT "<7>"
1850 PRINT  TAB(14);
1860 GOTO 1790
1870 LET N7=2+P*10
1880 ON ESC THEN GOTO 2370
1890 CALL 7,C7,D7,D8,N7,V0[1]
1900 ON ESC THEN GOTO 2330
1910 IF P=2 THEN GOTO 2020
1920 REM   [SCAN SPEED CHECK RESULTS]
1930 LET W=Q1+V0[4]*(Q2+Q3*V0[4])
1940 LET Y=Q1+V0[12]*(Q2+Q3*V0[12])
1950 LET R0=INT(((W-Y)*15)/5+.5)*5
1960 PRINT
1970 PRINT USING "EXPECTED SPEED: ### NM/MIN  ",R;
1980 PRINT USING "MEAS´D SPEED: ### NM/MIN  ",R0;
1990 PRINT USING "DIFF: -### NM/MIN",(R0-R)
2000 GOTO 1570
2010 REM   [SCAN SPEED SET RESULTS]
2020 LET W=Q1+V0[6]*(Q2+Q3*V0[6])
2030 LET X=Q1+V0[14]*(Q2+Q3*V0[14])
2040 LET Y=Q1+V0[22]*(Q2+Q3*V0[22])
2050 LET W=(W-X)*15
2060 LET Y=(X-Y)*15
2070 LET X=ABS(Y-W)/((Y+W)/2)
2080 IF X<5E-02 THEN GOTO 2130
2090 PRINT "<7>"

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVV0.L1

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2100 PRINT "MEASURED SCAN SPEED VARIED FROM ";
2110 PRINT USING "###.## NM/MIN  TO  ###.## NM/MIN",W,Y
2120 GOTO 1570
2130 LET R=(W+Y)/2
2140 LET R=INT(R/5+.5)*5
2150 PRINT
2160 PRINT "MEASURED SCAN SPEED IS APPROX.";R;"NM/MIN."
2170 ON ERR THEN GOTO 2240
2180 PRINT
2190 INPUT "IGNORE NEWLY SET SCAN SPEED ?  [N(CR) OR Y]  >>> ",A$
2200 ON ERR THEN STOP
2210 IF LEN(A$)=0 THEN GOTO 2270
2220 IF A$="N" THEN GOTO 2270
2230 IF A$="Y" THEN GOTO 1570
2240 ON ERR THEN STOP
2250 PRINT "<7>"
2260 GOTO 2170
2270 OPEN FILE[2,0],F0$,8
2280 ON ESC THEN GOTO 2330
2290 WRITE FILE[2,1],SYS(3),R
2300 CLOSE FILE[2]
2310 GOTO 1570
2320 REM   [ESC FROM SCAN CHECK/SET]
2330 NOESC
2340 CLOSE
2350 GOTO 1570
2360 REM   [ESC FROM CALL 7]
2370 LET C2=24823
2380 LET A2=0
2390 ON ERR THEN GOTO 2430
2400 CALL 257,C2,A2
2410 ON ERR THEN STOP
2420 GOTO 1570
2430 PRINT "<7>"
2440 PRINT "ERROR IN CALL 257 SCAN-STOP."
2450 GOTO 1570
2460 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
2470 REM          COLOR ANALYSIS SUMMARY REPORT SECTION
2480 REM
2490 NOESC
2500 IF A0$="RG" THEN LET F3$="UVV0.L4"
2510 IF A0$="RS" THEN LET F3$="UVV0.L5"

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE  7
                      PROGRAM LISTING FOR UVV0.L1

 1234567891123456789212345678931234567894123456789512345678961234567897
          0         0         0         0         0         0         0
 2520 GOTO 3950
 2530 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 2540 REM                    COLOR SAMPLE ANALYSIS SECTION
 2550 REM
 2560 ON ESC THEN GOTO 3350
 2570 LET F0$="UVVOL.DS"
 2580 LET I=0
 2590 OPEN FILE[4,0],F0$,21
 2600 READ FILE[4,0],I
 2610 IF I>0 THEN GOTO 3260
 2620 CLOSE FILE[4]
 2630 DELETE F0$
 2640 ON ERR THEN GOTO 2660
 2650 DELETE "UVVOL.PR"
 2660 ON ERR THEN GOTO 2680
 2670 DELETE "UVVOL.PF"
 2680 ON ERR THEN STOP
 2690 REM ----------  INIT DATA SUMMARY FILE
 2700 OPEN FILE[4,0],F0$,21
 2710 MAT U=ZER
 2720 LET U[4]=1
 2730 WRITE FILE[4,0],U[1],U[2],U[3],U[4]
 2740 REM ---------- VERIFY EXISTENCE OF TRANSM. CALIB. FILE
 2750 LET F0$="UVVOL.CF"
 2760 ON ERR THEN GOTO 3390
 2770 OPEN FILE[2,0],F0$,8
 2780 READ FILE[2,1],I,R
 2790 READ FILE[2,2],W1,W0
 2800 READ FILE[2,(W1-W0+2)],I,J
 2810 READ FILE[2,(W1-W0+3)],I,J
 2820 CLOSE FILE[2]
 2830 IF R<=0 THEN GOTO 3390
 2840 ON ERR THEN STOP
 2850 REM ----------  EXAMINE/(INIT) COLOR STANDARDS FILE
 2860 LET F0$="UVVOL.SF"
 2870 LET I=0
 2880 OPEN FILE[3,0],F0$,36
 2890 READ FILE[3,0],I
 2900 IF I>=1 THEN IF I<=6 THEN IF I=INT(I) THEN GOTO 2970
 2910 MAT U=ZER
 2920 LET I=1
 2930 WRITE FILE[3,0],U[1],I,U[2],U[3],U[4],U[5],U[6]

 1234567891123456789212345678931234567894123456789512345678961234567897
          0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE  8
                      PROGRAM LISTING FOR UVV0.L1

 1234567891123456789212345678931234567894123456789512345678961234567897
          0         0         0         0         0         0         0
 2940 FOR I=1 TO 3
 2950   WRITE FILE[3,I],U[1],U[2],U[3],U[4],U[5],U[6]
 2960 NEXT I
 2970 CLOSE FILE[3]
 2980 REM ----------  INIT PLOT REFERENCE & DATA FILES
 2990 LET F0$="UVVOL.PR"
 3000 ON ERR THEN GOTO 3020
 3010 RENAME F0$,F0$
 3020 ON ERR THEN STOP
 3030 IF SYS(7)=-48 THEN DELAY =1
 3040 IF SYS(7)=-48 THEN GOTO 3000
 3050 OPEN FILE[6,0],F0$,41
 3060 LET I=0
 3070 WRITE FILE[6,0],I,SYS(2),SYS(1),SYS(3)
 3080 LET L$=N1$
 3090 FOR I=(LEN(L$)+1) TO 20
 3100   LET L$=L$," "
 3110 NEXT I
 3120 LET L$=L$,N2$
 3130 WRITE FILE[6,1],L$
 3140 CLOSE FILE[6]
 3150 LET F0$="UVVOL.PF"
 3160 ON ERR THEN GOTO 3180
 3170 RENAME F0$,F0$
 3180 ON ERR THEN STOP
 3190 IF SYS(7)=-48 THEN DELAY =1
 3200 IF SYS(7)=-48 THEN GOTO 3160
 3210 OPEN FILE[5,0],F0$,4
 3220 LET I=1
 3230 WRITE FILE[5,0],I
 3240 CLOSE FILE[5]
 3250 REM ----------  PREPARE FOR ANALYSIS
 3260 LET I=POS("SCU",A0$[2,2],1)
 3270 READ FILE[4,0],U[1],U[2],U[3],U[4]
 3280 WRITE FILE[4,0],I,U[2],U[3],U[4]
 3290 CLOSE FILE[4]
 3300 REM   [BRANCH TO SAMPLE ANALYSIS MODULE]
 3310 NOESC
 3320 LET F3$="UVV0.L2"
 3330 GOTO 3950
 3340 REM ----------  ESCAPE DURING COLOR SAMPLE ANALYSIS SECTION
 3350 NOESC

 1234567891123456789212345678931234567894123456789512345678961234567897
          0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0       0
3360 CLOSE
3370 GOTO 0920
3380 REM ---------- BAD TRANSM. CALIB. FILE
3390 NOESC
3400 CLOSE
3410 PRINT "<7>"
3420 PRINT "INSUFFICIENT TRANSMITTANCE CALIBRATION DATA.";
3430 GOTO 0920
3440 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
3450 REM                COLOR ANALYSIS ENDING SECTION
3460 REM
3470 ON ESC THEN GOTO 3910
3480 REM ---------- EXAMINE/(PROCESS) PLOT REFERENCE FILE
3490 LET F0$="UVVOL.PR"
3500 LET N=0
3510 ON ERR THEN GOTO 3530
3520 RENAME F0$,F0$
3530 ON ERR THEN STOP
3540 IF SYS(7)=-48 THEN DELAY =1
3550 IF SYS(7)=-48 THEN GOTO 3510
3560 OPEN FILE[6,0],F0$,41
3570 READ FILE[6,0],N
3580 IF N=0 THEN CLOSE FILE[6]
3590 IF N=0 THEN GOTO 3810
3600 LET F0$="UVVOL.DS"
3610 OPEN FILE[4,0],F0$,21
3620 LET F0$="UVVOL.SF"
3630 OPEN FILE[3,0],F0$,36
3640 READ FILE[3,0],I,J,U1,U2,U3
3650 READ FILE[3,1],U[1],U[2],U[3],U[4],U[5],U[6]
3660 READ FILE[3,2],S[1],S[2],S[3],S[4],S[5],S[6]
3670 LET P0=1
3680 FOR I=1 TO N
3690   LET J=2+(I-1)*5
3700   READ FILE[6,J],L$,W0,W1,K,P
3710   LET I0=0
3720   IF L$[1,1]="C" THEN LET I0=2
3730   IF L$[1,2]="UN" THEN LET I0=3
3740   IF I0=0 THEN GOTO 3790
3750   LET F5=0
3760   ON (I0-1) THEN GOSUB 4040, 4230
3770   ON ESC THEN GOTO 3910

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0       0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0       0
3780   IF F5=0 THEN GOTO 3910
3790 NEXT I
3800 CLOSE
3810 LET I=0
3820 LET F0$="UVVOL.DS"
3830 OPEN FILE[4,0],F0$,21
3840 READ FILE[4,0],U[1],U[2],U[3],U[4]
3850 WRITE FILE[4,0],I,U[2],U[3],U[4]
3860 CLOSE FILE[4]
3870 NOESC
3880 LET F3$="UVV0.00"
3890 GOTO 3950
3900 REM ----------  ESCAPE DURING COLOR ANALYSIS ENDING SECTION
3910 NOESC
3920 CLOSE
3930 GOTO 0920
3940 REM ----------  EXIT POINT
3950 LET F0$="UVV00.TR"
3960 OPEN FILE[0,0],F0$,21
3970 WRITE FILE[0,1],F1$
3980 WRITE FILE[0,2],F2$
3990 WRITE FILE[0,3],F3$
4000 CLOSE FILE[0]
4010 CHAIN F3$
4020 REM ----------  PLOT REFERENCE FILE PROCESSING SUBRTS.
4030 REM   [FOR CHECK STANDARD]
4040 ON ESC THEN RETURN
4050 READ FILE[4,P0],I0,S$,O0,D0
4060 FOR I0=1 TO 6
4070   IF O0=A1[I0] THEN GOTO 4090
4080 NEXT I0
4090 LET O1=U1+D0*(U2+U3*D0)
4100 LET D0=ABS(D0-U[I0])
4110 LET S0=S[I0]+S[I0]
4120 IF D0<S0 THEN LET C0=0
4130 IF D0>=S0 THEN IF D0<=(S0+S[I0]) THEN LET C0=1
4140 IF D0>(S0+S[I0]) THEN LET C0=2
4150 LET L$="MEASURED ADMI: ",STR$(O1)
4160 WRITE FILE[6,J+3],L$
4170 LET L$="CONTROL RATING: ",R$[(C0*10)+1,(C0+1)*10]
4180 WRITE FILE[6,J+4],L$
4190 LET P0=P0+1

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0       0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE 11
                      PROGRAM LISTING FOR UVVO.L1

 1234567891123456789212345678931234567894123456789512345678961234567897
          0         0         0         0         0         0         0
4200 LET F5=1
4210 RETURN
4220 REM   [FOR UNKNOWN]
4230 ON ESC THEN RETURN
4240 LET N1$=""
4250 LET N2$=""
4260 READ FILE[4,P0],I0,S$,D0,O0
4270 IF O0>=1 THEN READ FILE[4,P0+1],N1$
4280 IF O0=2 THEN READ FILE[4,P0+2],N2$
4290 LET O1=U1+D0*(U2+U3*D0)
4300 LET L$="CALCULATED ADMI: ",STR$(O1)
4310 WRITE FILE[6,J+4],L$
4320 LET P0=P0+1+O0
4330 LET F5=1
4340 RETURN

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE 12
                      SYMBOL TABLE FOR UVVO.L1

SYMBOL    REFERENCES
------  ------------------------------------------------------------------
 0330   0160
 0380   0310
 0810   1030
 0920   0660  0810  1290  1340  1510  1570  1660  3370  3430  3930
 0940   1070
 1040   0940
 1110   1030
 1270   1110
 1300   1150  1190
 1380   1030
 1490   1380  1440
 1520   1450
 1570   1480  2000  2120  2230  2310  2350  2420  2450
 1590   1700
 1670   1590
 1720   1660
 1790   1860
 1830   1790
 1870   1820
 2020   1910
 2130   2080
 2170   2260
 2240   2170
 2270   2210  2220
 2330   1720  1900  2290
 2370   1880
 2430   2390
 2490   1030
 2560   1030
 2660   2640
 2680   2660
 2970   2900
 3000   3040
 3020   3000
 3160   3200
 3180   3160
 3260   2610
 3350   2560
 3390   2760  2830
 3470   0520  0540  0760  0920  1030
 3510   3550
 3530   3510
 3790   3740
 3810   3590
 3910   3470  3770  3780
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                       PAGE 13
                  SYMBOL TABLE FOR UVV0.L1

SYMBOL    REFERENCES
------  ------------------------------------------------------------
 3950   1260  2520  3330  3890
 4040   3760
 4090   4070
 4230   3760
 A$     0200  1620  1640  1650  1800  1820  2190  2210  2220  2230
 A0$    0200  0980  1000  1010  1020  2500  2510  3260
 A1[    0220  0250  0260  0270  0280  0290  0300  4070
 A2     2380  2400
 C$     0210  0230  1020
 C0     4120  4130  4140  4170
 C2     2370  2400
 C5     0460
 C6     0460
 C7     0460  1890
 D0     4050  4090  4100  4120  4130  4140  4260  4290
 D7     1390  1890
 D8     1400  1890
 F0     0400  0730
 F0$    0200  0350  0380  0390  0550  0560  0600  0630  0690  0700
        1120  1140  1420  1430  2270  2570  2590  2630  2700  2750
        2770  2860  2880  2990  3010  3050  3150  3170  3210  3490
        3520  3560  3600  3610  3620  3630  3820  3830  3950  3960
 F1     0400  0710  0730
 F1$    0200  0350  0410  0490  3970
 F2$    0200  0350  0420  0490  0500  3980
 F3$    0200  0350  0430  0500  0510  1250  2500  2510  3320  3880
        3990  4010
 F5     0170  0360  0520  3750  3780  4200  4330
 FL#0   0390  0400  0410  0420  0430  0440  0450  0460  0470  0700
        0730  0740  0750  3960  3970  3980  3990  4000
 FL#1   0560  0570  0580
 FL#2   1140  1160  1170  1220  1230  1430  1460  1470  1500  1550
        2270  2290  2300  2770  2780  2790  2800  2810  2820
 FL#3   0630  0640  0650  2880  2890  2930  2950  2970  3630  3640
        3650  3660
 FL#4   2590  2600  2620  2700  2730  3270  3280  3290  3610  3830
        3840  3850  3860  4050  4260
 FL#5   3210  3230  3240
 FL#6   3050  3070  3130  3140  3560  3570  3700  4160  4180  4310
 I      0610  0640  0660  0720  0740  1160  1170  1460  2580  2600
        2610  2780  2800  2810  2870  2890  2900  2920  2930  2940
        2950  2960  3060  3070  3090  3110  3220  3230  3260  3280
        3640  3680  3690  3790  3810  3850
 I0     3710  3720  3730  3740  3760  4050  4060  4070  4080  4100
        4110  4130  4140  4260
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                       PAGE 14
                  SYMBOL TABLE FOR UVV0.L1

SYMBOL    REFERENCES
------  ------------------------------------------------------------
 J      0620  0640  0660  1160  2800  2810  3640  3690  3700  4160
        4180  4310
 K      3700
 L$     0210  3080  3090  3100  3120  3130  3700  3720  3730  4150
        4160  4170  4180  4300  4310
 N      3500  3570  3580  3590  3680
 N1$    0210  0440  3080  4240  4270
 N2$    0210  0450  3120  4250  4280
 N7     1870  1890
 O0     4050  4070  4260  4270  4280  4320
 O1     4090  4150  4290  4300
 P      1020  1030  1650  1660  1740  1870  1910  3700
 P0     3670  4050  4190  4260  4270  4280  4320
 Q1     0570  1930  1940  2020  2030  2040
 Q2     0570  1930  1940  2020  2030  2040
 Q3     0570  1930  1940  2020  2030  2040
 R      1130  1170  1190  1410  1460  1540  1970  1990  2130  2140
        2160  2290  2780  2830
 R$     0210  0240  4170
 R0     1950  1980  1990
 S$     0210  4050  4260
 S0     4110  4120  4130  4140
 S[     0220  3660  4110  4130  4140
 U      2710  2910
 U1     3640  4090  4290
 U2     3640  4090  4290
 U3     3640  4090  4290
 U[     0220  2720  2730  2930  2950  3270  3280  3650  3840  3850
        4100
 V$     0220  1730  1740  1760
 V0[    0220  1890  1930  1940  2020  2030  2040
 W      1930  1950  2020  2050  2070  2110  2130
 W0     1210  1220  2790  2800  2810  3700
 W1     1200  1220  2790  2800  2810  3700
 X      2030  2050  2060  2070  2080
 Y      1940  1950  2040  2060  2070  2110  2130
```

MANUAL DATA-ENTRY COLOR ANALYSIS MODULE -- UVVO.LO

UVVO.LO is nearly the same as UVVO.L1. The following material will elaborate on how the former module differs from the latter. Variable descriptions for UVVO.LO may be found in Table 22. An overview flowchart for it is shown in Figure 15.

UVVO.LO is chained to from UVVO.OO, UVVO.L3, UVVO.L4, or UVVO.L5. In the program initialization, no parameters need be accessed from the wavelength calibration file. Also, no check of the 30-Selected-Ordinate method file's existence needs to be made, since the manual data-entry method does not require this file.

The transmittance calibration and scanning mechanism speed checking/setting functions are disabled, and their code is not included in this module. However,the report commands operate in the same way as in UVVO.L1.

When preparing for the first sample analysis of a run, it is necessary neither to check for the transmittance calibration file, nor to initialize the plot-related files. The historical standards file, for the manual mode, is UVVOL.SM, and the "destination" program for a sample analysis command is UVVO.L3.

In the chlorophyll analysis ending section, there is no need to deal with the plot-related files.

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                      PAGE  1
                  PROGRAM LISTING FOR UVV0.LO

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0010 REM          ++++++++++++++++++++++++++++++++++++++
0020 REM          +   AUTOMATED  ULTRAVIOLET-VISIBLE   +
0030 REM          +      SPECTROPHOTOMETER SYSTEM      +
0040 REM          +         MANUAL COLOR ANALY-        +
0050 REM          +         SIS MODULE: UVV0.LO        +
0060 REM          +   WRITTEN BY GREG ROTH (6/16/80)   +
0070 REM          +   UNIV. OF CINCI. COMPUTER CENTER  +
0080 REM          ++++++++++++++++++++++++++++++++++++++
0090 REM
0100 REM
0110 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0120 REM                  PROGRAM INITIALIZATION
0130 REM
0140 REM ----------  SET PAGE/ESC/ROUTE-FLAG
0150 PAGE =72
0160 ON ESC THEN GOTO 0310
0170 LET F5=0
0180 ESC
0190 REM ----------  DIM/INIT STRING VARS'S AND ARRAYS
0200 DIM F0$[13],F1$[13],F2$[13],F3$[13],A0$[2],A$[1]
0210 DIM C$[14],A1[6],U[6]
0220 LET C$="RGRSASACAUE H "
0230 LET A1[1]=25
0240 LET A1[2]=50
0250 LET A1[3]=100
0260 LET A1[4]=150
0270 LET A1[5]=200
0280 LET A1[6]=250
0290 GOTO 0360
0300 REM ----------  ESCAPE DURING PROGRAM INITIALIZATION
0310 NOESC
0320 CLOSE
0330 DIM F0$[13],F1$[13],F2$[13],F3$[13]
0340 LET F5=1
0350 REM ----------  RETRIEVE SYSTEM STATUS PARMS.
0360 LET F0$="UVV00.TR"
0370 OPEN FILE[0,0],F0$,21
0380 READ FILE[0,0],F0,F1
0390 READ FILE[0,1],F1$
0400 READ FILE[0,2],F2$
0410 READ FILE[0,3],F3$
0420 CLOSE FILE[0]

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                      PAGE  2
                  PROGRAM LISTING FOR UVV0.LO

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0430 REM   [MODIFY PROGRAM LOCATION VAR'S]
0440 LET F1$=F2$
0450 LET F2$=F3$
0460 LET F3$=""
0470 IF F5=1 THEN GOTO 1300
0480 GOTO 0620
0490 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0500 REM                COLOR ANALYSIS COMMAND LEVEL
0510 REM
0520 REM ----------  COLOR ANALYSIS COMMAND LIST
0530 ON ESC THEN GOTO 0620
0540 PRINT
0550 PRINT "RG ---  GENERAL SUMMARY REPORT"
0560 PRINT "RS ---  SUMMARY STANDARDS REPORT"
0570 PRINT "AS ---  ANALYSIS OF SET OF UPDATE STANDARDS"
0580 PRINT "AC ---  ANALYSIS OF CHECK STANDARD(S)"
0590 PRINT "AU ---  ANALYSIS OF UNKNOWN(S)"
0600 PRINT "E  ---  END OF COLOR ANALYSIS"
0610 REM ----------  COLOR ANALYSIS COMMAND SELECT
0620 ON ESC THEN GOTO 1300
0630 ESC
0640 ON ERR THEN GOTO 0740
0650 PRINT
0660 PRINT
0670 PRINT "COLOR ANALYSIS COMMANDS:  ";
0680 INPUT "RG, RS, AS, AC, AU, E, H(CR)  >>> ",A0$
0690 ON ERR THEN STOP
0700 IF LEN(A0$)=0 THEN LET A0$="H "
0710 IF LEN(A0$)=1 THEN LET A0$=A0$," "
0720 LET P=(POS(C$,A0$,1)-1)/2+1
0730 ON P THEN GOTO 0810, 0810, 0880, 0880, 0880, 1300, 0530
0740 ON ERR THEN STOP
0750 PRINT "<7>"
0760 PRINT "INVALID COMMAND.";
0770 GOTO 0640
0780 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0790 REM            COLOR ANALYSIS SUMMARY REPORT SECTION
0800 REM
0810 NOESC
0820 IF A0$="RG" THEN LET F3$="UVV0.L4"
0830 IF A0$="RS" THEN LET F3$="UVV0.L5"
0840 GOTO 1450

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                         PAGE  3
                        PROGRAM LISTING FOR UVV0.L0

 1234567891123456789212345678931234567894123456789512345678961234567897
          0         0         0         0         0         0         0
0850 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0860 REM              COLOR SAMPLE ANALYSIS SECTION
0870 REM
0880 ON ESC THEN GOTO 1240
0890 LET F0$="UVV0L.DS"
0900 LET I=0
0910 OPEN FILE[4,0],F0$,21
0920 READ FILE[4,0],I
0930 IF I>0 THEN GOTO 1150
0940 CLOSE FILE[4]
0950 DELETE F0$
0960 OPEN FILE[4,0],F0$,21
0970 REM ----------  INIT DATA SUMMARY FILE
0980 MAT U=ZER
0990 LET U[4]=1
1000 WRITE FILE[4,0],U[1],U[2],U[3],U[4]
1010 REM ----------  EXAMINE/(INIT) COLOR STANDARDS FILE
1020 LET F0$="UVV0L.SM"
1030 LET I=0
1040 OPEN FILE[3,0],F0$,36
1050 READ FILE[3,0],I
1060 IF I>=1 THEN IF I<=6 THEN IF I=INT(I) THEN GOTO 1130
1070 MAT U=ZER
1080 LET I=1
1090 WRITE FILE[3,0],U[1],I,U[2],U[3],U[4],U[5],U[6]
1100 FOR I=1 TO 3
1110   WRITE FILE[3,I],U[1],U[2],U[3],U[4],U[5],U[6]
1120 NEXT I
1130 CLOSE FILE[3]
1140 REM ----------  PREPARE FOR ANALYSIS
1150 LET I=POS("SCU",A0$[2,2],1)
1160 READ FILE[4,0],U[1],U[2],U[3],U[4]
1170 WRITE FILE[4,0],I,U[2],U[3],U[4]
1180 CLOSE FILE[4]
1190 REM   [BRANCH TO SAMPLE ANALYSIS MODULE]
1200 NOESC
1210 LET F3$="UVV0.L3"
1220 GOTO 1450
1230 REM ----------  ESCAPE DURING COLOR SAMPLE ANALYSIS SECTION
1240 NOESC
1250 CLOSE
1260 GOTO 0620

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                         PAGE  4
                        PROGRAM LISTING FOR UVV0.L0

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
1270 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
1280 REM              COLOR ANALYSIS ENDING SECTION
1290 REM
1300 ON ESC THEN GOTO 1410
1310 LET I=0
1320 LET F0$="UVV0L.DS"
1330 OPEN FILE[4,0],F0$,21
1340 READ FILE[4,0],U[1],U[2],U[3],U[4]
1350 WRITE FILE[4,0],I,U[2],U[3],U[4]
1360 CLOSE FILE[4]
1370 NOESC
1380 LET F3$="UVV0.00"
1390 GOTO 1450
1400 REM ----------  ESCAPE DURING COLOR ANALYSIS ENDING SECTION
1410 NOESC
1420 CLOSE
1430 GOTO 0620
1440 REM ----------  EXIT POINT
1450 LET F0$="UVV00.TR"
1460 OPEN FILE[0,0],F0$,21
1470 WRITE FILE[0,1],F1$
1480 WRITE FILE[0,2],F2$
1490 WRITE FILE[0,3],F3$
1500 CLOSE FILE[0]
1510 CHAIN F3$

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-´-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE  5
                         SYMBOL TABLE FOR UVV0.LO

SYMBOL   REFERENCES
------  ---------------------------------------------------------------
 0310   0160
 0360   0290
 0530   0730
 0620   0480  0530  1260  1430
 0640   0770
 0740   0640
 0810   0730
 0880   0730
 1130   1060
 1150   0930
 1240   0880
 1300   0470  0620  0730
 1410   1300
 1450   0840  1220  1390
 A$     0200
 A0$    0200  0680  0700  0710  0720  0820  0830  1150
 A1[    0210  0230  0240  0250  0260  0270  0280
 C$     0210  0220  0720
 F0     0380
 F0$    0200  0330  0360  0370  0890  0910  0950  0960  1020  1040
        1320  1330  1450  1460
 F1     0380
 F1$    0200  0330  0390  0440  1470
 F2$    0200  0330  0400  0440  0450  1480
 F3$    0200  0330  0410  0450  0460  0820  0830  1210  1380  1490
        1510
 F5     0170  0340  0470
 FL#0   0370  0380  0390  0400  0410  0420  1460  1470  1480  1490
        1500
 FL#3   1040  1050  1090  1110  1130
 FL#4   0910  0920  0940  0960  1000  1160  1170  1180  1330  1340
        1350  1360
 I      0900  0920  0930  1030  1050  1060  1080  1090  1100  1110
        1120  1150  1170  1310  1350
 P      0720  0730
 U      0980  1070
 U[     0210  0990  1000  1090  1110  1160  1170  1340  1350
```

AUTOMATED COLOR SAMPLE ANALYSIS MODULE -- UVVO.L2

UVVO.L2 is chained to from UVVO.L1 or from its called module UVVO.L4. It initializes variables and retrieves parameters from the following files: UVVOO.TR; UVVOO.CF; UVVOL.SF; UVVOL.DS; and UVVOL.CF. Program control flows along one of two paths, based on the chained-from module.

If chained to from UVVO.L1, the module computes the Munsell Values for a "colorless" solution, effectively using as data an array of 100 percent transmittance values over the scan range. The module then jumps, according to the sample-type flag, to the proper section for processing update standards, check standards, or unknowns.

If chained to from UVVO.L4, the module retrieves from the data summary file the previously computed Munsell Values for a "colorless" solution. It then jumps to the option-select section for check standards/unknowns.

Update standards are processed sequentially from ADMI 25 to ADMI 250. Each standard is scanned, and the data reduced to a DE number. After each scan, the DE and control rating are displayed and may be accepted at the discretion of the user. Once all standards have been studied, the results are written to the automated color historical standards file UVVOL.SF. (See Table 27.) The module then chains to the color update standards report/update module UVVO.L6 via the program exit point. Should an escape be issued anytime during the update standards process, a branch is immediately made to the program ending section.

The color check standards/unknowns option-select section directs program control for the processing of subsequent check standards or unknowns. Options are presented for: 1) processing another sample (of the particular type); 2) preparing a report which summarizes results of all samples of the particular type; and 3) continuing the analysis. The first options effects a branch to the check standards/unknowns process section, while the second causes a branch to the intermediate report section. The third option induces a chain to UVVO.L1 via the program exit point.

The color check standards/unknowns process section begins with the definition of the sample identifier either by the system or the user. All sample identifiers are eight characters long, and any blanks are changed to zeroes. If defined by the system, the sample identifier has the form SMMDDNNN, where S is either a "C" character (for a check standard) or a "U" character (for an unknown), MM is the month date, DD is the day date, and NNN is the sample numbering counter.

The process section continues by defining the ADMI for a check standard, or a comment for an unknown. The sample is then scanned. Data are reduced, displayed, and offered for acceptance. If they are accepted, three operations take place. First, results are written to the data summary file. Second, a partial plot reference file information block is appended. (A header record of the block is written, wherein the minor heading is simply a "2" for a check standard, or a "3" for an unknown.) Third, the apropriate counter and the sample pointer are incremented and are written to the data summary file.

In the intermediate report section for check standards or unknowns, the present 'colorless' Munsell Values are written to the next available record in the data summary file. The module then defines the "destination" program as UVVO.L4, and skips to the program exit point.

In the program ending section, the "destination" program is defined as UVVO.L1. Control drops down to the program exit point.

At the program exit point, modified program location variables are written to the system status transfer file. The module then chains to the "destination" program.

Five subroutines are used in UVVO.L2. One of them is the Data Acquisition/Reduction subroutine, to which a separate section of this document is devoted.

Another subroutine is the results-computation subroutine. It is composed of five sequential operations, which are: 1) conversion of transmittance signals to percent transmittance values; 2) computation of tristimulus values using the 30-Selected-Ordinate method file UVVOO.SF; 3) iterative derivation of Munsell Values from corresponding tristimulus values; 4) calculation of DE number from the Munsell Values; 5) computation of ADMI values as a function of the DE number.

The other three subroutines display results for a single update standard, check standard, or unknown. For an update or check standard, control ratings are computed within its respective subroutine.

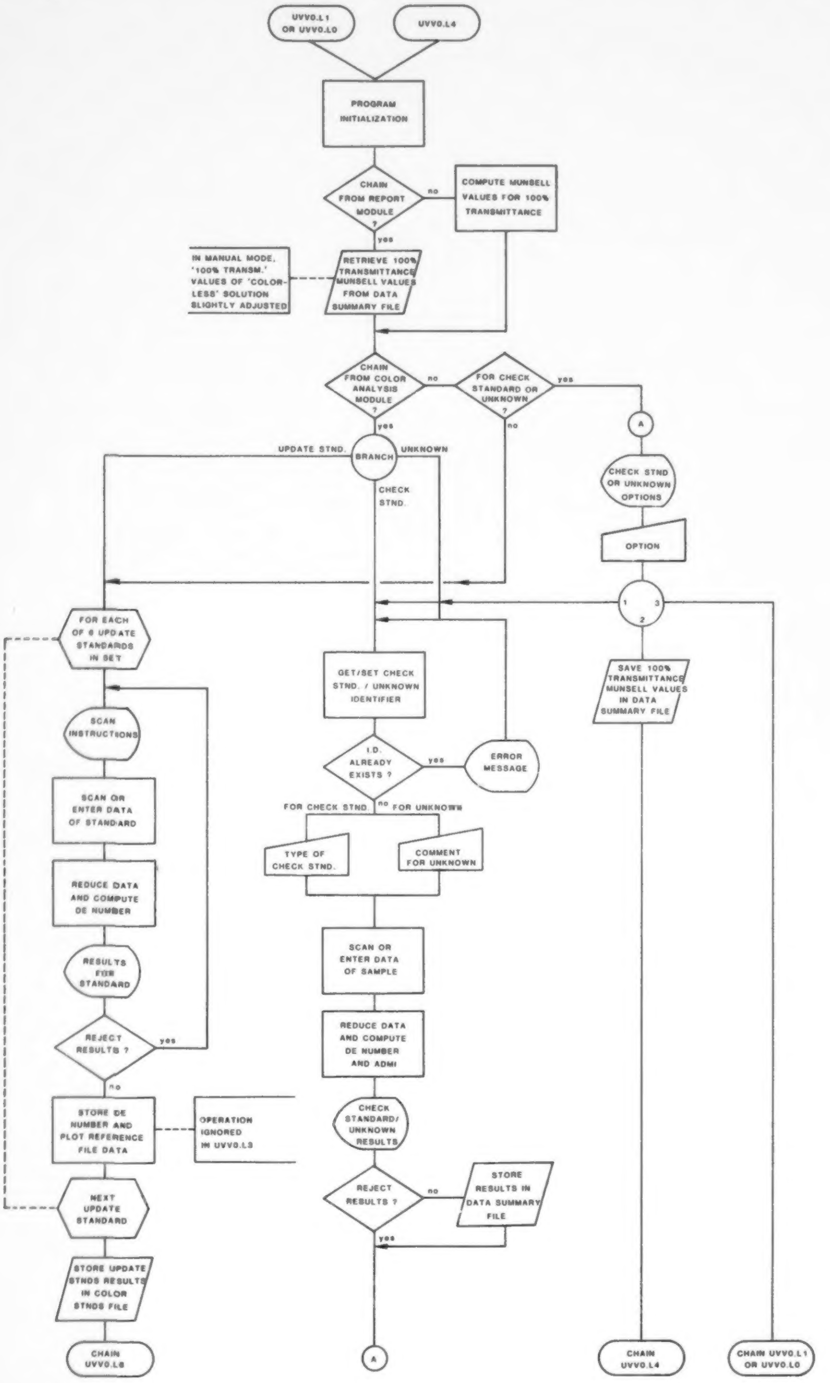

UVV0.L1 OR UVV0.L0
UVV0.L4
PROGRAM INITIALIZATION
CHAIN FROM REPORT MODULE ?
no
yes
COMPUTE MUNSELL VALUES FOR 100% TRANSMITTANCE
IN MANUAL MODE, '100% TRANSM.' VALUES OF 'COLORLESS' SOLUTION SLIGHTLY ADJUSTED
RETRIEVE 100% TRANSMITTANCE MUNSELL VALUES FROM DATA SUMMARY FILE
CHAIN FROM COLOR ANALYSIS MODULE ?
no
FOR CHECK STANDARD OR UNKNOWN ?
yes
no
yes
A
UPDATE STND.
BRANCH
UNKNOWN
CHECK STND.
CHECK STND OR UNKNOWN OPTIONS
OPTION
1
2
3
FOR EACH OF 6 UPDATE STANDARDS IN SET
SCAN INSTRUCTIONS
SCAN OR ENTER DATA OF STANDARD
REDUCE DATA AND COMPUTE DE NUMBER
RESULTS FOR STANDARD
REJECT RESULTS ?
yes
no
STORE DE NUMBER AND PLOT REFERENCE FILE DATA
OPERATION IGNORED IN UVV0.L3
NEXT UPDATE STANDARD
STORE UPDATE STNDS RESULTS IN COLOR STNDS FILE
CHAIN UVV0.L6
GET/SET CHECK STND. / UNKNOWN IDENTIFIER
I.D. ALREADY EXISTS ?
yes
ERROR MESSAGE
FOR CHECK STND.
no
FOR UNKNOWN
TYPE OF CHECK STND.
COMMENT FOR UNKNOWN
SCAN OR ENTER DATA OF SAMPLE
REDUCE DATA AND COMPUTE DE NUMBER AND ADMI
CHECK STANDARD/ UNKNOWN RESULTS
REJECT RESULTS ?
no
STORE RESULTS IN DATA SUMMARY FILE
yes
A
SAVE 100% TRANSMITTANCE MUNSELL VALUES IN DATA SUMMARY FILE
CHAIN UVV0.L4
CHAIN UVV0.L1 OR UVV0.L0

Figure 16. Flowchart of modules UVV0.L2 and UVV0.L3.

TABLE 23. VARIABLE DESCRIPTIONS FOR MODULES UVVO.L2 AND UVVO.L3

A	the computed ADMI
A$	a single-character user-response variable
A0	the standards type (1-6 corresponding to ADMI 25-250)
A1()	the ADMI values of the six APHA standards
A2*	an accumulator used by CALL 257
A6*	the averaged A/D count from CALL 6
C0*	the number of signal values taken from the end of one scan array and placed at the beginning of the next
C1$	the comment for an unknown
C2*	the CALL 257 indicator number for scan-clear (for stop)
C5*	the transmittance signal channel number
C6*	the wavelength signal channel number
C7*	the CALL 7 channel-indicator number
D	the measured DE number
D7*	the CALL 7 initial time delay (in sixtieth seconds)
D8*	the CALL 7 between-signal pairs time delay (in sixtieth seconds)
E	the absolute value difference between mean standard and measured DE numbers
F0$	a file name variable
F1$, F2$, F3$	program location variables; see Table 1
F1()	factors used in the iterative Munsell Values computation
F5	a flag used during program initialization; also used in all subroutines (other than Data Acquisition/Reduction), where:

Before subrt.	After subroutine
F5 = 0	F5 = 0 for escape during subroutine F5 = 1 for completed subroutine process

F6*	a flag used by the Data Acquisition/Reduction (DAR) subroutine where, initially set to zero, is returned as:

F6 = 1 for completed subroutine function
F6 = 2 for escape during scan; restart scan
F6 = 3 for escape during scan; do not restart scan

H	a loop-counter for the six update standards
I,I0*	loop-counter and general-purpose variables
I$	the identifier of a check standard or an unknown
I0$	a character string used to set/check sample identifiers
J,K,L	loop-counter and general-purpose variables
J1*,J2*	scan array pointers used in the DAR subroutine
K0*	the highest wavelength of the spectrophotometer or the V0 scan array prior to scanning
K1*	the limit above which K0 must be before a scan may begin
L$	an output character string

TABLE 23. (Continued)

MO	the sample-type flag, where: MO = 1 for update standard MO = 2 for check standard MO = 3 for unknown
MO()	the computed Munsell Values
M1, M2, M3	the Munsell Values for a "colorless" solution
M()	the computed DE numbers of the six APHA standards
NO*	the total number of values to fill the VO scan array
N1	the check standards counter (number of check standards analyzed)
N2	the unknowns counter (number of unknowns analyzed)
N1$,N2$	the analyst's and instrument's names
N6*	the number of A/D counts to be acquired and averaged in a CALL 6
N7*	the actual number of counts to be put in the VO scan array
O$	the sample-type character string
PO*	the plot file pointer (to the next available plot file record)
P1	the next available record in the data summary file
Q1*,Q2*,Q3*	the constants of the wavelength calibration equation
R*	the scan speed (in nanometers per minute)
R$	an output character string used for control ratings
RO	a control rating indicator for update/check standards
RO$,R1$	output character strings used for control ratings
S2	two times the standard deviation of a standard mean DE
S()	the standard deviations of the standards mean DE's
TO,T()	variables used in the iterative Munsell Values computation
T1()	in UVVO.L3 only, the tristimulus values for a 'colorless' solution
U1, U2, U3	the constants of the standards curve
U()	the mean DE's of the six APHA standards
VO()*	the CALL 7 scan (data storage) array
V1, V2, V3, V4	variables used in the iterative Munsell Values computation
W*,X*,Y*	general-purpose variables usually representing wavelength
WO*,W1*	the lower and upper scan range wavelength bounds
XO*,X1*	the lower and upper wavelength bounds evaluated after a scan portion
Z()	the array in which evaluated A/D counts at nanometer increments are stored and subsequently reduced to percent transmittance values and smoothed

* Starred variables are used in module UVVO.L2 only.

PROGRAM LISTING FOR UVV0.L2

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0010 REM            ++++++++++++++++++++++++++++++++++++++++
0020 REM            +   AUTOMATED  ULTRAVIOLET-VISIBLE     +
0030 REM            +      SPECTROPHOTOMETER SYSTEM        +
0040 REM            +       AUTOMATED COLOR SAMPLE         +
0050 REM            +        ANALYSIS MOD.: UVV0.L2        +
0060 REM            +   WRITTEN BY GREG ROTH  (6/5/80)     +
0070 REM            +   UNIV. OF CINCI. COMPUTER CENTER    +
0080 REM            +   (UVV0.L2 IS SUB-MODULE OF AUT'D    +
0090 REM            +   COLOR ANALYSIS MODULE UVV0.L1)     +
0100 REM            ++++++++++++++++++++++++++++++++++++++++
0110 REM
0120 REM
0130 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0140 REM                       PROGRAM INITIALIZATION
0150 REM
0160 REM ----------  SET PAGE/ESC/ROUTE-FLAG
0170 PAGE =72
0180 ON ESC THEN GOTO 0510
0190 LET F5=0
0200 ESC
0210 REM ----------  DIM/INIT STRING VAR'S AND ARRAYS
0220 DIM F0$[13],F1$[13],F2$[13],F3$[13],N1$[20],N2$[20]
0230 DIM A$[1],L$[72],R$[30],O$[12],I$[8],I0$[8],C1$[30]
0240 DIM R0$[3],R1$[3]
0250 DIM A1[6],M[6],U[6],S[6],M0[3]
0260 LET I0=81
0270 DIM V0[(I0+1)*2],T[3],F1[5]
0280 LET D7=0
0290 LET D8=0
0300 LET A6=0
0310 LET N6=5
0320 LET R$="IN CONTROLWARNING   OUT OF CTL"
0330 LET R0$="***"
0340 LET A1[1]=25
0350 LET A1[2]=50
0360 LET A1[3]=100
0370 LET A1[4]=150
0380 LET A1[5]=200
0390 LET A1[6]=250
0400 REM   [MUNSELL CONVERSION CONSTANTS]
0410 LET T[1]=98.045
0420 LET T[2]=100

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVV0.L2

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0430 LET T[3]=118.1
0440 LET F1[1]=1.2219E-02
0450 LET F1[2]=-2.3111E-03
0460 LET F1[3]=2.3951E-03
0470 LET F1[4]=-2.1009E-04
0480 LET F1[5]=8.404E-06
0490 GOTO 0560
0500 REM ----------  ESCAPE DURING PROG. INIT.
0510 NOESC
0520 CLOSE
0530 DIM F0$[13],F1$[13],F2$[13],F3$[13]
0540 LET F5=1
0550 REM ----------  RETRIEVE SYSTEM STATUS PARM'S
0560 LET F0$="UVV00.TR"
0570 OPEN FILE[0,0],F0$,21
0580 READ FILE[0,1],F1$
0590 READ FILE[0,2],F2$
0600 READ FILE[0,3],F3$
0610 READ FILE[0,4],N1$
0620 READ FILE[0,5],N2$
0630 READ FILE[0,6],C5,C6,C7
0640 CLOSE FILE[0]
0650 REM   [MODIFY PROGRAM LOCATION VAR'S]
0660 LET F1$=F2$
0670 LET F2$=F3$
0680 LET F3$=F1$
0690 IF F5=1 THEN GOTO 4520
0700 ON ESC THEN GOTO 4520
0710 IF F1$="UVV0.L4" THEN LET F5=1
0720 REM ----------  RETRIEVE WAVELENGTH CALIBRATION DATA
0730 LET F0$="UVV00.CF"
0740 OPEN FILE[1,0],F0$,20
0750 READ FILE[1,1],Q1,Q2,Q3
0760 CLOSE FILE[1]
0770 REM ----------  RETRIEVE COLOR STANDARDS DATA
0780 LET F0$="UVV0L.SF"
0790 OPEN FILE[3,0],F0$,36
0800 READ FILE[3,0],K,J,U1,U2,U3
0810 READ FILE[3,1],U[1],U[2],U[3],U[4],U[5],U[6]
0820 READ FILE[3,2],S[1],S[2],S[3],S[4],S[5],S[6]
0830 CLOSE FILE[3]
0840 REM ---------- RETRIEVE BASIC DATA SUMMARY PARM'S

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE  3
                      PROGRAM LISTING FOR UVV0.L2

 1234567891123456789212345678931234567894123456789512345678961234567897
          0         0         0         0         0         0         0
0850 LET F0$="UVV0L.DS"
0860 OPEN FILE[4,0],F0$,21
0870 READ FILE[4,0],M0,N1,N2,P1
0880 IF F5=1 THEN READ FILE[4,P1],M1,M2,M3
0890 CLOSE FILE[4]
0900 IF M0=1 THEN LET O$="UPDATE STNDS"
0910 IF M0=2 THEN LET O$="CHECK STND"
0920 IF M0=3 THEN LET O$="UNKNOWN"
0930 IF F5=1 THEN GOTO 0990
0940 PRINT
0950 PRINT "PREPARING FOR ANALYSIS OF ";O$;
0960 IF M0>1 THEN PRINT "(S)";
0970 PRINT "."
0980 REM ----------  RETRIEVE TRANSMITTANCE CALIBRATION PARM'S
0990 LET F0$="UVV0L.CF"
1000 OPEN FILE[2,0],F0$,8
1010 READ FILE[2,1],I,R
1020 READ FILE[2,2],W1,W0
1030 REM   [DIM/INIT REMAINING SCAN VAR'S]
1040 LET D8=3600/R
1050 DIM Z[W1-W0+1]
1060 IF F5=1 THEN CLOSE FILE[2]
1070 IF F5=1 THEN GOTO 1200
1080 REM   [COMPUTE MUNSELL RENOTATIONS FOR 100%T]
1090 FOR I=W1 TO W0 STEP -1
1100   READ FILE[2,(W1-I+3)],J,Z[W1-I+1]
1110 NEXT I
1120 CLOSE FILE[2]
1130 LET F5=0
1140 GOSUB 5820
1150 ON ESC THEN GOTO 4520
1160 IF F5=0 THEN GOTO 4520
1170 LET M1=M0[1]
1180 LET M2=M0[2]
1190 LET M3=M0[3]
1200 IF F1$="UVV0.L1" THEN ON M0 THEN GOTO 1240, 2300, 2300
1210 IF M0>1 THEN GOTO 2120
1220 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
1230 REM                   PROCESS UPDATE STANDARDS
1240 FOR H=1 TO 6
1250   ON ERR THEN GOTO 1320
1260   PRINT

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE  4
                      PROGRAM LISTING FOR UVV0.L2

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
1270   PRINT "FOR UPDATE STANDARD ADMI";A1[H];":"
1280   PRINT "  SET AT";(W1+5);"NM., SET FOR SCAN AND";
1290   INPUT " PRESS CR KEY. ",A$
1300   ON ERR THEN STOP
1310   IF LEN(A$)=0 THEN GOTO 1360
1320   ON ERR THEN STOP
1330   PRINT "<7>"
1340   GOTO 1250
1350   REM ----------  SCAN AND REDUCE DATA
1360   LET F6=0
1370   GOSUB 4670
1380   ON ESC THEN GOTO 4520
1390   ON F6 THEN GOTO 1440, 1250, 4520
1400   PRINT "<7>"
1410   PRINT "ABNORMAL SCAN INTERRUPT."
1420   GOTO 4520
1430   REM ----------  COMPUTE/DISPLAY RESULTS
1440   LET F5=0
1450   GOSUB 5820
1460   ON ESC THEN GOTO 4520
1470   IF F5=0 THEN GOTO 4520
1480   LET F5=0
1490   GOSUB 6720
1500   ON ESC THEN GOTO 4520
1510   IF F5=0 THEN GOTO 4520
1520   REM ----------  OPTIONAL RESULTS REJECTION
1530   ON ERR THEN GOTO 1610
1540   PRINT
1550   PRINT "REJECT RESULTS OF ADMI";A1[H];"SCAN ?";
1560   INPUT "  [N(CR) OR Y]  >>> ",A$
1570   ON ERR THEN STOP
1580   IF LEN(A$)=0 THEN GOTO 1650
1590   IF A$="N" THEN GOTO 1650
1600   IF A$="Y" THEN GOTO 1250
1610   ON ERR THEN STOP
1620   PRINT "<7>"
1630   GOTO 1530
1640   REM ----------  STORE RESULTS
1650   LET M[H]=D
1660   LET F0$="UVV0L.PF"
1670   ON ERR THEN GOTO 1690
1680   RENAME F0$,F0$

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
1690    ON ERR THEN STOP
1700    IF SYS(7)=-48 THEN DELAY =1
1710    IF SYS(7)=-48 THEN GOTO 1670
1720    OPEN FILE[5,0],F0$,4
1730    READ FILE[5,0],K
1740    FOR I=0 TO (W1-W0)
1750      WRITE FILE[5,K+I],Z[I+1]
1760    NEXT I
1770    WRITE FILE[5,0],(K+(W1-W0+1))
1780    CLOSE FILE[5]
1790    LET F0$="UVVOL.PR"
1800    ON ERR THEN GOTO 1820
1810    RENAME F0$,F0$
1820    ON ERR THEN STOP
1830    IF SYS(7)=-48 THEN DELAY =1
1840    IF SYS(7)=-48 THEN GOTO 1800
1850    OPEN FILE[6,0],F0$,41
1860    READ FILE[6,0],I
1870    LET J=2+I*5
1880    WRITE FILE[6,J],"UPDATE STANDARD",W0,W1,1,K
1890    LET L$="ADMI OF APHA STANDARD: ",STR$(A1[H])
1900    WRITE FILE[6,J+1],L$
1910    LET L$="CONTROL STANDARDS MEAN DE: ",STR$(U[H])
1920    WRITE FILE[6,J+2],L$
1930    LET L$="MEASURED DE: ",STR$(M[H])
1940    WRITE FILE[6,J+3],L$
1950    LET L$="CONTROL RATING: ",R$[(R0*10)+1,(R0+1)*10]
1960    WRITE FILE[6,J+4],L$
1970    READ FILE[6,0],I,J,K,L
1980    WRITE FILE[6,0],(I+1),J,K,L
1990    CLOSE FILE[6]
2000 NEXT H
2010 LET F0$="UVVOL.SF"
2020 OPEN FILE[3,0],F0$,36
2030 WRITE FILE[3,10],M[1],M[2],M[3],M[4],M[5],M[6]
2040 CLOSE FILE[3]
2050 NOESC
2060 CLOSE
2070 LET F3$="UVV0.L6"
2080 GOTO 4560
2090 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
2100 REM            COLOR CHECK STND/UNKNOWN OPTION-SELECT

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2110 REM
2120 ON ESC THEN GOTO 4520
2130 ESC
2140 ON ERR THEN GOTO 2220
2150 PRINT
2160 PRINT "SELECT:"
2170 PRINT " ANOTHER ";O$;"[1], ";O$;"S REPORT[2], OR ";
2180 INPUT "CONTINUE[3(CR)] >> ",A$
2190 ON ERR THEN STOP
2200 IF LEN(A$)=0 THEN LET A$="3"
2210 ON POS("123",A$,1) THEN GOTO 2300, 4360, 4520
2220 ON ERR THEN STOP
2230 PRINT "<7>"
2240 PRINT "PLEASE ENTER 1, 2, OR 3."
2250 GOTO 2140
2260 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
2270 REM            CHECK STANDARD / UNKNOWN PROCESS SECTION
2280 REM
2290 REM ---------- GET/SET I.D.
2300 ON ESC THEN GOTO 4300
2310 ON ERR THEN GOTO 2380
2320 PRINT
2330 PRINT O$;" ID:  [USER-SET OR AUTOMATIC(CR)]";
2340 INPUT "  >>> ",I0$
2350 ON ERR THEN STOP
2360 IF LEN(I0$)>0 THEN GOTO 2520
2370 GOTO 2420
2380 ON ERR THEN STOP
2390 PRINT "<7>"
2400 GOTO 2310
2410 REM   [AUTOMATIC-SET I.D.]
2420 LET I$=O$[1,1],"0000000"
2430 LET I0$=STR$(SYS(2))
2440 LET I$[4-LEN(I0$),3]=I0$
2450 LET I0$=STR$(SYS(1))
2460 LET I$[6-LEN(I0$),5]=I0$
2470 IF M0=2 THEN LET I0$=STR$(N1+1)
2480 IF M0=3 THEN LET I0$=STR$(N2+1)
2490 LET I$[9-LEN(I0$),8]=I0$
2500 GOTO 2590
2510 REM   [USER-SET I.D.]
2520 LET K=LEN(I0$)

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE  7
                   PROGRAM LISTING FOR UVV0.L2

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2530 FOR I=1 TO K
2540   IF I0$[I,I]=" " THEN LET I0$[I,I]="0"
2550 NEXT I
2560 LET I$="00000000"
2570 LET I$[9-LEN(I0$),8]=I0$
2580 REM   [VERIFY I.D.]
2590 ON ERR THEN GOTO 2660
2600 PRINT
2610 PRINT O$;" ID: ";I$;
2620 INPUT "  [KEEP(CR) OR CHANGE]  >>> ",I0$
2630 ON ERR THEN STOP
2640 IF LEN(I0$)>0 THEN GOTO 2520
2650 GOTO 2700
2660 ON ERR THEN STOP
2670 PRINT "<7>"
2680 GOTO 2590
2690 REM   [CHECK FOR I.D. REPETITION]
2700 LET F0$="UVVOL.DS"
2710 OPEN FILE[4,0],F0$,21
2720 LET J=1
2730 FOR I=1 TO (N1+N2)
2740   READ FILE[4,J],K,I0$,D,L
2750   IF I$=I0$ THEN GOTO 2800
2760   LET J=J+1+(K-2)*L
2770 NEXT I
2780 CLOSE FILE[4]
2790 ON (M0-1) THEN GOTO 2850, 3210
2800 CLOSE FILE[4]
2810 PRINT "<7>"
2820 PRINT O$;" ID ";I$;" ALREADY EXISTS."
2830 GOTO 2310
2840 REM   [GET CHECK STND ADMI]
2850 ON ERR THEN GOTO 2960
2860 PRINT
2870 PRINT "SELECT ";O$;" TYPE  [1-6 OR H(CR)]";
2880 INPUT "  >>> ",A$
2890 ON ERR THEN STOP
2900 IF LEN(A$)=0 THEN GOTO 3120
2910 IF A$="H" THEN GOTO 3120
2920 ON ERR THEN GOTO 2960
2930 LET A0=VAL(A$)
2940 ON ERR THEN STOP

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE  8
                   PROGRAM LISTING FOR UVV0.L2

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2950 IF A0>=1 THEN IF A0<=6 THEN IF A0=INT(A0) THEN GOTO 3000
2960 ON ERR THEN STOP
2970 PRINT "<7>"
2980 PRINT "PLEASE ENTER SINGLE NUMBER OR TYPE H(CR)."
2990 GOTO 2850
3000 ON ERR THEN GOTO 3080
3010 PRINT
3020 PRINT O$;" ";I$;" IS ADMI ";STR$(A1[A0]);".";
3030 INPUT "   CHANGE ?  [N(CR) OR Y]  >>> ",A$
3040 ON ERR THEN STOP
3050 IF LEN(A$)=0 THEN GOTO 3330
3060 IF A$="N" THEN GOTO 3330
3070 IF A$="Y" THEN GOTO 2850
3080 ON ERR THEN STOP
3090 PRINT "<7>"
3100 GOTO 3000
3110 REM   [(LIST #S & ADMI'S)]
3120 FOR I=1 TO 4 STEP 3
3130   PRINT
3140   FOR J=0 TO 2
3150     PRINT "   ";STR$(I+J);" -- ADMI ";
3160     PRINT STR$(A1[I+J]);";";
3170   NEXT J
3180 NEXT I
3190 GOTO 2850
3200 REM   [GET UNKNOWN COMMENT]
3210 ON ERR THEN GOTO 3290
3220 PRINT
3230 PRINT "COMMENT FOR UNKNOWN:         ";C1$
3240 INPUT "  [KEEP(CR) OR CHANGE]  >>> ",L$
3250 ON ERR THEN STOP
3260 IF LEN(L$)=0 THEN GOTO 3330
3270 LET C1$=L$[1,30]
3280 GOTO 3210
3290 ON ERR THEN STOP
3300 PRINT "<7>"
3310 GOTO 3210
3320 REM ----------  SCAN CHECK STND / UNKNOWN
3330 ON ERR THEN GOTO 3400
3340 PRINT
3350 PRINT "FOR ";O$;" ";I$;":"
3360 PRINT "  SET AT";(W1+5);"NM., SET FOR SCAN AND";

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
3370 INPUT " PRESS CR KEY.  ",A$
3380 ON ERR THEN STOP
3390 IF LEN(A$)=0 THEN GOTO 3430
3400 ON ERR THEN STOP
3410 PRINT "<7>"
3420 GOTO 3330
3430 LET F6=0
3440 GOSUB 4670
3450 ON ESC THEN GOTO 4300
3460 ESC
3470 ON F6 THEN GOTO 3520, 3330, 4300
3480 PRINT "<7>"
3490 PRINT "ABNORMAL SCAN INTERRUPT."
3500 GOTO 4300
3510 REM ----------  COMPUTE/DISPLAY RESULTS
3520 LET F5=0
3530 GOSUB 5820
3540 ON ESC THEN GOTO 4300
3550 IF F5=0 THEN GOTO 4300
3560 LET F5=0
3570 ON (M0-1) THEN GOSUB 6440, 6640
3580 ON ESC THEN GOTO 4300
3590 IF F5=0 THEN GOTO 4300
3600 REM ----------  OPTIONAL RESULTS REJECTION
3610 ON ERR THEN GOTO 3690
3620 PRINT
3630 PRINT "REJECT RESULTS FOR ";O$;" ";I$;
3640 INPUT " ?  [N(CR) OR Y]  >>> ",A$
3650 ON ERR THEN STOP
3660 IF LEN(A$)=0 THEN GOTO 3720
3670 IF A$="N" THEN GOTO 3720
3680 IF A$="Y" THEN GOTO 4300
3690 ON ERR THEN STOP
3700 PRINT "<7>"
3710 GOTO 3610
3720 LET F0$="UVVOL.DS"
3730 OPEN FILE[4,0],F0$,21
3740 IF M0=3 THEN GOTO 3810
3750 REM   [FOR CHECK STANDARD]
3760 WRITE FILE[4,P1],M0,I$,A1[A0],D
3770 LET N1=N1+1
3780 LET P1=P1+1

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
3790 GOTO 3870
3800 REM   [FOR UNKNOWNS]
3810 LET J=INT((LEN(C1$)+14)/15)
3820 WRITE FILE[4,P1],M0,I$,D,J
3830 IF J>=1 THEN WRITE FILE[4,P1+1],C1$[1,15]
3840 IF J=2 THEN WRITE FILE[4,P1+2],C1$[16]
3850 LET N2=N2+1
3860 LET P1=P1+1+J
3870 WRITE FILE[4,0],M0,N1,N2,P1
3880 CLOSE FILE[4]
3890 REM   [FILL PLOT FILE]
3900 LET F0$="UVVOL.PF"
3910 ON ERR THEN GOTO 3930
3920 RENAME F0$,F0$
3930 ON ERR THEN STOP
3940 IF SYS(7)=-48 THEN DELAY =1
3950 IF SYS(7)=-48 THEN GOTO 3910
3960 OPEN FILE[5,0],F0$,4
3970 READ FILE[5,0],P0
3980 FOR I=0 TO (W1-W0)
3990   WRITE FILE[5,P0+I],Z[I+1]
4000 NEXT I
4010 WRITE FILE[5,0],(P0+(W1-W0+1))
4020 CLOSE FILE[5]
4030 REM   [ADD BLOCK TO PLOT REFERENCE FILE]
4040 LET F0$="UVVOL.PR"
4050 ON ERR THEN GOTO 4070
4060 RENAME F0$,F0$
4070 ON ERR THEN STOP
4080 IF SYS(7)=-48 THEN DELAY =1
4090 IF SYS(7)=-48 THEN GOTO 4050
4100 OPEN FILE[6,0],F0$,41
4110 READ FILE[6,0],I,J,K,L
4120 IF M0=2 THEN LET L$="CHECK STANDARD"
4130 IF M0=3 THEN LET L$="UNKNOWN"
4140 WRITE FILE[6,(2+I*5)],L$,W0,W1,1,P0
4150 LET L$="IDENTIFIER: ",I$
4160 WRITE FILE[6,(3+I*5)],L$
4170 IF M0=2 THEN LET L$="EXPECTED ADMI: ",STR$(A1[A0])
4180 IF M0=3 THEN LET L$="COMMENT: ",C1$
4190 WRITE FILE[6,(4+I*5)],L$
4200 IF M0=2 THEN LET L$="MEASURED ADMI: ",STR$(A)

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVV0.L2

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
4210 IF M0=3 THEN LET L$="MEASURED DE: ",STR$(D)
4220 WRITE FILE[6,(5+I*5)],L$
4230 IF M0=2 THEN LET L$="CONTROL RATING: ",R$[(R0*10)+1,(R0+1)*10]
4240 IF M0=2 THEN IF R0=1 THEN LET L$="CONTROL RATING: ",R$[11,17]
4250 IF M0=3 THEN LET L$="CALCULATED ADMI: ",STR$(A)
4260 WRITE FILE[6,(6+I*5)],L$
4270 WRITE FILE[6,0],(I+1),J,K,L
4280 CLOSE FILE[6]
4290 REM ----------  ESCAPE DURING OR RETURN TO OPT-SELECT
4300 NOESC
4310 CLOSE
4320 GOTO 2120
4330 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
4340 REM    INTERMEDIATE COLOR CS/UNKNOWNS ANALYSIS REPORT SECTION
4350 REM
4360 ON ESC THEN GOTO 4460
4370 LET F0$="UVV0L.DS"
4380 OPEN FILE[4,0],F0$,21
4390 READ FILE[4,0],M0,N1,N2,P1
4400 WRITE FILE[4,P1],M1,M2,M3
4410 NOESC
4420 CLOSE
4430 LET F3$="UVV0.L4"
4440 GOTO 4560
4450 REM ----------  ESCAPE BEFORE REPORT PREP.
4460 NOESC
4470 CLOSE
4480 GOTO 2120
4490 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
4500 REM           COLOR CS/UNKNOWNS ANALYSIS ENDING SECTION
4510 REM
4520 NOESC
4530 CLOSE
4540 LET F3$="UVV0.L1"
4550 REM ----------  EXIT POINT
4560 LET F0$="UVV00.TR"
4570 OPEN FILE[0,0],F0$,21
4580 WRITE FILE[0,1],F1$
4590 WRITE FILE[0,2],F2$
4600 WRITE FILE[0,3],F3$
4610 CLOSE FILE[0]
4620 CHAIN F3$

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVV0.L2

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
4630 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
4640 REM                      SUBROUTINES
4650 REM
4660 REM ----------  DATA ACQUISITION/REDUCTION SUBROUTINE
4670 ON ESC THEN GOTO 5510
4680 LET F6=1
4690 LET X1=W1
4700 LET K1=X1
4710 LET C0=0
4720 REM   [MAKE SURE WAVELENGTH HIGH ENOUGH]
4730 ON ESC THEN GOTO 5510
4740 CALL 6,C6,N6,A6
4750 LET K0=Q1+A6*(Q2+Q3*A6)
4760 IF K0>K1 THEN GOTO 4870
4770 PRINT
4780 PRINT "SET WAVELENGTH UP";(K1-INT(K0)+1);"NM."
4790 ON ERR THEN GOTO 4830
4800 INPUT "PRESS CR KEY TO CONTINUE SCAN. ",A$
4810 ON ERR THEN STOP
4820 IF LEN(A$)=0 THEN GOTO 4730
4830 ON ERR THEN STOP
4840 PRINT "<7>"
4850 GOTO 4790
4860 REM   [MAKE SURE SCAN-TO WL. NOT BELOW (LOW WL.BOUND - 5)]
4870 LET K0=INT(K0)
4880 LET X0=K0-I0
4890 IF X0<(W0-5) THEN LET X0=(W0-5)
4900 PRINT "     SCANNING FROM";K0;"TO";X0;"NM.    ";
4910 REM   [SET #-OF-POINTS PARM. & SCAN]
4920 LET N0=(K0-X0+1)*2
4930 LET N7=N0-C0
4940 ON ESC THEN GOTO 5430
4950 ON ERR THEN GOTO 5750
4960 CALL 7,C7,D7,D8,N7,V0[1+C0]
4970 ON ESC THEN GOTO 5510
4980 ON ERR THEN STOP
4990 REM   [CHECK RANGE: HIGH ENOUGH START; OVER HALF SCANNED]
5000 LET W=Q1+V0[2]*(Q2+Q3*V0[2])
5010 LET Y=Q1+V0[N0]*(Q2+Q3*V0[N0])
5020 IF W<X1 THEN GOTO 5040
5030 IF (W-Y)>(N0/4) THEN GOTO 5160
5040 PRINT "<7>"

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
12345678911234567892123456789312345678941234567895123456789612345678 97
         0         0         0         0         0         0         0
5050 PRINT "PROBLEM IN SCAN RANGE;"
5060 PRINT "SET WAVELENGTH AT";X1+1;"NM.;"
5070 ON ERR THEN GOTO 5110
5080 INPUT "PRESS CR KEY TO CONTINUE SCAN. ",A$
5090 ON ERR THEN STOP
5100 IF LEN(A$)=0 THEN GOTO 4730
5110 ON ERR THEN STOP
5120 PRINT "<7>"
5130 GOTO 5070
5140 GOTO 4740
5150 REM   [DETERMINE LOWEST WAVELEN IN CALL 7 ARRAY]
5160 LET X0=-INT(-(Q1+V0[N0]*(Q2+Q3*V0[N0])))
5170 IF X0<W0 THEN LET X0=W0
5180 REM   [EVALUATE PERCENT TRANSMITTANCE VALUES]
5190 PRINT "EVALUATING AT";X1;"THRU";X0;"NM."
5200 LET J2=0
5210 ON ERR THEN STOP
5220 FOR I=X1 TO X0 STEP -1
5230   LET J2=J2+2
5240   IF J2>N0 THEN GOTO 5340
5250   LET W=Q1+V0[J2]*(Q2+Q3*V0[J2])
5260   IF W>=I THEN GOTO 5230
5270   LET J1=J2-2
5280   LET L=I
5290   LET Y=Q1+V0[J1]*(Q2+Q3*V0[J1])
5300   LET X=(I-Y)/(W-Y)
5310   LET Z[W1-L+1]=V0[J1-1]-X*(V0[J2-1]-V0[J1-1])
5320   LET J2=J1-2
5330 NEXT I
5340 LET X1=L-1
5350 IF X1<W0 THEN RETURN
5360 LET C0=((N0-J1)+2)
5370 FOR I=1 TO C0
5380   LET V0[I]=V0[(J1-2)+I]
5390 NEXT I
5400 LET K1=X1-1
5410 GOTO 4730
5420 REM   [ESCAPE DURING SCAN; ISSUE SCAN-CLEAR; ROUTE]
5430 LET N0=N7+C0
5440 LET C2=24823
5450 LET A2=0
5460 ON ERR THEN GOTO 5690

12345678911234567892123456789312345678941234567895123456789612345678 97
         0         0         0         0         0         0         0
```

```
12345678911234567892123456789312345678941234567895123456789612345678 97
         0         0         0         0         0         0         0
5470 CALL 257,C2,A2
5480 ON ERR THEN STOP
5490 PRINT "<7>";
5500 PRINT "SCAN INTERRUPT."
5510 NOESC
5520 ON ESC THEN RETURN
5530 LET F6=2
5540 ESC
5550 ON ERR THEN GOTO 5620
5560 PRINT
5570 INPUT "RESTART SCAN ?  [N(CR) OR Y]  >>> ",A$
5580 ON ERR THEN STOP
5590 IF LEN(A$)=0 THEN LET A$="N"
5600 IF A$="N" THEN GOTO 5650
5610 IF A$="Y" THEN GOTO 5650
5620 ON ERR THEN STOP
5630 PRINT "<7>"
5640 GOTO 5550
5650 NOESC
5660 LET F6=2
5670 IF A$="N" THEN LET F6=3
5680 RETURN
5690 NOESC
5700 ON ERR THEN STOP
5710 PRINT "<7>"
5720 PRINT "UNEXPECTED ERROR IN CALL 257 SCAN-CLEAR."
5730 LET F6=2
5740 RETURN
5750 NOESC
5760 ON ERR THEN STOP
5770 PRINT "<7>"
5780 PRINT "UNEXPECTED ERROR IN CALL 7."
5790 LET F6=2
5800 RETURN
5810 REM ----------  RESULTS-COMPUTATION SUBRT.
5820 ON ESC THEN RETURN
5830 LET F0$="UVV0L.CF"
5840 OPEN FILE[2,0],F0$,8
5850 FOR I=W1 TO W0 STEP -1
5860   READ FILE[2,(W1-I+3)],X,Y
5870   LET Z[W1-I+1]=((Z[W1-I+1]-X)/(Y-X))*100
5880 NEXT I

12345678911234567892123456789312345678941234567895123456789612345678 97
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                   PAGE 15
                  PROGRAM LISTING FOR UVV0.L2

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
5890 CLOSE FILE[2]
5900 REM   [SMOOTH RESULTS]
5910 LET X=Z[1]
5920 LET W=Z[2]
5930 FOR I=3 TO (W1-W0-1)
5940   LET Y=X
5950   LET X=W
5960   LET W=-3*(Z[I-2]+Z[I+2])
5970   LET W=W+12*(Z[I-1]+Z[I+1])
5980   LET W=W+17*Z[I]
5990   LET W=W/35
6000   LET Z[I-2]=Y
6010 NEXT I
6020 LET Z[W1-W0-2]=X
6030 LET Z[W1-W0-1]=W
6040 REM   [COMPUTE TRISTIMULUS VALUES]
6050 LET F0$="UVV00.SF"
6060 OPEN FILE[7,0],F0$,8
6070 MAT M0=ZER
6080 FOR I=1 TO 90
6090   READ FILE[7,I],W,J
6100   LET K=INT(W)
6110   LET L=-INT(-W)
6120   LET M0[J]=M0[J]+Z[W1-K+1]+(Z[W1-L+1]-Z[W1-K+1])*(W-K)
6130 NEXT I
6140 CLOSE FILE[7]
6150 LET M0[1]=M0[1]*3.269E-02
6160 LET M0[2]=M0[2]*3.333E-02
6170 LET M0[3]=M0[3]*3.938E-02
6180 REM   [CONVERT TRISTIMULUS VALUES TO MUNSELL RENOTATIONS]
6190 FOR I=1 TO 3
6200   LET T0=M0[I]/T[I]
6210   IF T0<0 THEN LET T0=0
6220   LET V1=10*SQR(T0)
6230   FOR J=1 TO 15
6240     LET V2=V1
6250     LET V3=0
6260     LET V4=0
6270     FOR L=1 TO 5
6280       LET V3=V3+F1[L]*V1^L
6290       LET V4=V4+(F1[L]*L)*V1^(L-1)
6300     NEXT L

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                   PAGE 16
                  PROGRAM LISTING FOR UVV0.L2

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
6310       LET V1=V1-((V3-T0)/V4)
6320       IF ABS(V2-V1)<1E-07 THEN GOTO 6340
6330   NEXT J
6340   LET M0[I]=V1
6350 NEXT I
6360 REM   [COMPUTE DE NUMBER]
6370 LET D=(.23*(M2-M0[2]))^2
6380 LET D=D+(M1-M2-M0[1]+M0[2])^2
6390 LET D=SQR(D+(.4*(M2-M3-M0[2]+M0[3]))^2)
6400 LET A=U1+D*(U2+D*U3)
6410 LET F5=1
6420 RETURN
6430 REM ----------  CHECK STNDS RESULTS-DISPLAY SUBRT.
6440 ON ESC THEN RETURN
6450 LET S2=S[A0]+S[A0]
6460 LET E=ABS(U[A0]-D)
6470 IF E>(S[A0]+S2) THEN LET R0=2
6480 IF E>=S2 THEN IF E<=(S[A0]+S2) THEN LET R0=1
6490 IF E<S2 THEN LET R0=0
6500 LET L$="STANDARD>> MEAN DE[A] OF ADMI ###: "
6510 LET L$=L$,"-#.####   STND DEV OF MEAN: -#.####"
6520 PRINT
6530 PRINT "FOR CHECK STANDARD ";I$
6540 PRINT USING L$,A1[A0],U[A0],S[A0]
6550 LET L$="MEASURED>> DE[B]: -#.####"
6560 PRINT USING L$,D;
6570 LET L$="-#.####   CTL RAT'G: ##########"
6580 PRINT "  DIFF[A-B]: ";
6590 PRINT USING L$,(U[A0]-D),R$[(R0*10)+1,(R0+1)*10]
6600 PRINT USING "COMPUTED>> ADMI:---#.###",A
6610 LET F5=1
6620 RETURN
6630 REM ---------- UNKNOWNS RESULTS-DISPLAY SUBRT.
6640 ON ESC THEN RETURN
6650 LET L$="FOR UNKNOWN ########    MEASURED DE: "
6660 LET L$=L$,"-#.####   COMPUTED ADMI:----#.###"
6670 PRINT
6680 PRINT USING L$,I$,D,A
6690 LET F5=1
6700 RETURN
6710 REM ----------  UPDATE STNDS RESULTS-DISPLAY SUBRT.
6720 ON ESC THEN RETURN

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                      PAGE 17
                 PROGRAM LISTING FOR UVV0.L2
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
6730 LET S2=S[H]+S[H]
6740 LET E=ABS(U[H]-D)
6750 IF E>(S[H]+S2) THEN LET R0=2
6760 IF E>=S2 THEN IF E<=(S[H]+S2) THEN LET R0=1
6770 IF E<S2 THEN LET R0=0
6780 LET L$="STANDARD>> MEAN DE[A] OF ADMI ###: -#.#### "
6790 LET L$=L$,"  STND DEV OF MEAN: -#.####"
6800 PRINT
6810 PRINT USING L$,A1[H],U[H],S[H]
6820 LET L$="MEASURED>> DE[B]: -#.####"
6830 PRINT USING L$,D;
6840 LET L$="-#.####   CTL RAT'G: ##########"
6850 PRINT "  DIFF[A-B]: ";
6860 PRINT USING L$,(U[H]-D),R$[(R0*10)+1,(R0+1)*10]
6870 LET F5=1
6880 RETURN
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                      PAGE 18
                              SYMBOL TABLE FOR UVV0.L2
SYMBOL    REFERENCES
------    -----------------------------------------------------------
0510    0180
0560    0490
0990    0930
1200    1070
1240    1200
1250    1340   1390   1600
1320    1250
1360    1310
1440    1390
1530    1630
1610    1530
1650    1580   1590
1670    1710
1690    1670
1800    1840
1820    1800
2120    1210   4320   4480
2140    2250
2220    2140
2300    1200   2210
2310    2400   2830
2380    2310
2420    2370
2520    2360   2640
2590    2500   2680
2660    2590
2700    2650
2800    2750
2850    2790   2990   3070   3190
2960    2850   2920
3000    2950   3100
3080    3000
3120    2900   2910
3210    2790   3280   3310
3290    3210
3330    3050   3060   3260   3420   3470
3400    3330
3430    3390
3520    3470
3610    3710
3690    3610
3720    3660   3670
3810    3740
3870    3790
3910    3950
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE 19
                        SYMBOL TABLE FOR UVV0.L2

SYMBOL   REFERENCES
------   ---------------------------------------------------------------
 3930    3910
 4050    4090
 4070    4050
 4300    2300  3450  3470  3500  3540  3550  3580  3590  3680
 4360    2210
 4460    4360
 4520    0690  0700  1150  1160  1380  1390  1420  1460  1470  1500
         1510  2120  2210
 4560    2080  4440
 4670    1370  3440
 4730    4820  5100  5410
 4740    5140
 4790    4850
 4830    4790
 4870    4760
 5040    5020
 5070    5130
 5110    5070
 5160    5030
 5230    5260
 5340    5240
 5430    4940
 5510    4670  4730  4970
 5550    5640
 5620    5550
 5650    5600  5610
 5690    5460
 5750    4950
 5820    1140  1450  3530
 6340    6320
 6440    3570
 6640    3570
 6720    1490
 A       4200  4250  6400  6600  6680
 A$      0230  1290  1310  1560  1580  1590  1600  2180  2200  2210
         2880  2900  2910  2930  3030  3050  3060  3070  3370  3390
         3640  3660  3670  3680  4800  4820  5080  5100  5570  5590
         5600  5610  5670
 A0      2930  2950  3020  3760  4170  6450  6460  6470  6480  6540
         6590
 A1[     0250  0340  0350  0360  0370  0380  0390  1270  1550  1890
         3020  3160  3760  4170  6540  6810
 A2      5450  5470
 A6      0300  4740  4750
 C0      4710  4930  4960  5360  5370  5430
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE 20
                        SYMBOL TABLE FOR UVV0.L2

SYMBOL   REFERENCES
------   ---------------------------------------------------------------
 C1$     0230  3230  3270  3810  3830  3840  4180
 C2      5440  5470
 C5      0630
 C6      0630  4740
 C7      0630  4960
 D       1650  2740  3760  3820  4210  6370  6380  6390  6400  6460
         6560  6590  6680  6740  6830  6860
 D7      0280  4960
 D8      0290  1040  4960
 E       6460  6470  6480  6490  6740  6750  6760  6770
 F0$     0220  0530  0560  0570  0730  0740  0780  0790  0850  0860
         0990  1000  1660  1680  1720  1790  1810  1850  2010  2020
         2700  2710  3720  3730  3900  3920  3960  4040  4060  4100
         4370  4380  4560  4570  5830  5840  6050  6060
 F1$     0220  0530  0580  0660  0680  0710  1200  4580
 F1[     0270  0440  0450  0460  0470  0480  6280  6290
 F2$     0220  0530  0590  0660  0670  4590
 F3$     0220  0530  0600  0670  0680  2070  4430  4540  4600  4620
 F5      0190  0540  0690  0710  0880  0930  1060  1070  1130  1160
         1440  1470  1480  1510  3520  3550  3560  3590  6410  6610
         6690  6870
 F6      1360  1390  3430  3470  4680  5530  5660  5670  5730  5790
 FL#0    0570  0580  0590  0600  0610  0620  0630  0640  4570  4580
         4590  4600  4610
 FL#1    0740  0750  0760
 FL#2    1000  1010  1020  1100  1120  5840  5860  5890
 FL#3    0790  0800  0810  0820  0830  2020  2030  2040
 FL#4    0860  0870  0890  2710  2740  2780  2800  3730  3760  3820
         3870  3880  4380  4390  4400
 FL#5    1720  1730  1750  1770  1780  3960  3970  3990  4010  4020
 FL#6    1850  1860  1880  1900  1920  1940  1960  1970  1980  1990
         4100  4110  4140  4160  4190  4220  4260  4270  4280
 FL#7    6060  6090  6140
 H       1240  1270  1550  1650  1890  1910  1930  2000  6730  6740
         6750  6760  6810  6860
 I       1010  1090  1100  1110  1740  1750  1760  1860  1870  1970
         1980  2530  2540  2550  2730  2770  3120  3150  3160  3180
         3980  3990  4000  4110  4140  4160  4190  4220  4260  4270
         5220  5260  5280  5300  5330  5370  5380  5390  5850  5860
         5870  5880  5930  5960  5970  5980  6000  6010  6080  6090
         6130  6190  6200  6340  6350
 I$      0230  2420  2440  2460  2490  2560  2570  2610  2750  2820
         3020  3350  3630  3760  3820  4150  6530  6680
 I0      0260  0270  4880
 I0$     0230  2340  2360  2430  2440  2450  2460  2470  2480  2490
```

```
A-U-T-'-D    U-V-V-I-S    S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R    S-Y-S-T-E-M
9/2/1980                                                              PAGE 21
                          SYMBOL TABLE FOR UVVO.L2

SYMBOL   REFERENCES
------   ---------------------------------------------------------------
         2520  2540  2570  2620  2640  2740  2750
 J       0800  1100  1870  1880  1900  1920  1940  1960  1970  1980
         2720  2740  2760  3140  3150  3160  3170  3810  3820  3830
         3840  3860  4110  4270  6090  6120  6230  6330
 J1      5270  5290  5310  5320  5360  5380
 J2      5200  5230  5240  5250  5270  5310  5320
 K       0800  1730  1750  1770  1880  1970  1980  2520  2530  2740
         2760  4110  4270  6100  6120
 K0      4750  4760  4780  4870  4880  4900  4920
 K1      4700  4760  4780  5400
 L       1970  1980  2740  2760  4110  4270  5280  5310  5340  6110
         6120  6270  6280  6290  6300
 L$      0230  1890  1900  1910  1920  1930  1940  1950  1960  3240
         3260  3270  4120  4130  4140  4150  4160  4170  4180  4190
         4200  4210  4220  4230  4240  4250  4260  6500  6510  6540
         6550  6560  6570  6590  6650  6660  6680  6780  6790  6810
         6820  6830  6840  6860
 M0      0870  0900  0910  0920  0960  1200  1210  2470  2480  2790
         3570  3740  3760  3820  3870  4120  4130  4170  4180  4200
         4210  4230  4240  4250  4390  6070
 M0[     0250  1170  1180  1190  6120  6150  6160  6170  6200  6340
         6370  6380  6390
 M1      0880  1170  4400  6380
 M2      0880  1180  4400  6370  6380  6390
 M3      0880  1190  4400  6390
 M[      0250  1650  1930  2030
 N0      4920  4930  5010  5030  5160  5240  5360  5430
 N1      0870  2470  2730  3770  3870  4390
 N1$     0220  0610
 N2      0870  2480  2730  3850  3870  4390
 N2$     0220  0620
 N6      0310  4740
 N7      4930  4960  5430
 O$      0230  0900  0910  0920  0950  2170  2330  2420  2610  2820
         2870  3020  3350  3630
 P0      3970  3990  4010  4140
 P1      0870  0880  3760  3780  3820  3830  3840  3860  3870  4390
         4400
 Q1      0750  4750  5000  5010  5160  5250  5290
 Q2      0750  4750  5000  5010  5160  5250  5290
 Q3      0750  4750  5000  5010  5160  5250  5290
 R       1010  1040
 R$      0230  0320  1950  4230  4240  6590  6860
 R0      1950  4230  4240  6470  6480  6490  6590  6750  6760  6770
         6860
```

```
A-U-T-'-D    U-V-V-I-S    S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R    S-Y-S-T-E-M
9/2/1980                                                              PAGE 22
                          SYMBOL TABLE FOR UVVO.L2

SYMBOL   REFERENCES
------   ---------------------------------------------------------------
 R0$     0240  0330
 R1$     0240
 S2      6450  6470  6480  6490  6730  6750  6760  6770
 S[      0250  0820  6450  6470  6480  6540  6730  6750  6760  6810
 T0      6200  6210  6220  6310
 T[      0270  0410  0420  0430  6200
 U1      0800  6400
 U2      0800  6400
 U3      0800  6400
 U[      0250  0810  1910  6460  6540  6590  6740  6810  6860
 V0[     0270  4960  5000  5010  5160  5250  5290  5310  5380
 V1      6220  6240  6280  6290  6310  6320  6340
 V2      6240  6320
 V3      6250  6280  6310
 V4      6260  6290  6310
 W       5000  5020  5030  5250  5260  5300  5920  5950  5960  5970
         5980  5990  6030  6090  6100  6110  6120
 W0      1020  1050  1090  1740  1770  1880  3980  4010  4140  4890
         5170  5350  5850  5930  6020  6030
 W1      1020  1050  1090  1100  1280  1740  1770  1880  3360  3980
         4010  4140  4690  5310  5850  5860  5870  5930  6020  6030
         6120
 X       5300  5310  5860  5870  5910  5940  5950  6020
 X0      4880  4890  4900  4920  5160  5170  5190  5220
 X1      4690  4700  5020  5060  5190  5220  5340  5350  5400
 Y       5010  5030  5290  5300  5860  5870  5940  6000
 Z[      1050  1100  1750  3990  5310  5870  5910  5920  5960  5970
         5980  6000  6020  6030  6120
```

MANUAL COLOR SAMPLE ANALYSIS MODULE --UVVO.L3

UVVO.L3 is sufficiently similar to the automated color sample analysis module, UVVO.L3, that only the differences between the two need be underscored. Variable descriptions for UVVO.L3 may be found in Table 23, and an overview flowchart of it is shown in Figure 16. One general point to be made is that throughout UVVO.L3, chaining is from or to UVVO.L0 rather than UVVO.L1. Also, any use of the historical standards file in UVVO.L3 is to be understood as UVVOL.SM rather than UVVOL.SF.

The program initialization for UVVO.L3 is the same as for UVVO.L2, except that no wavelength and transmittance calibration data (from files UVVOO.CF and UVVOL.CF) need be retrieved. Also, the computation of "colorless" solution Munsell Values differs in that predefined "colorless" pseudo-tristimulus values are used for the manual method, rather than those computed from 100% transmittance values.

The remaining sections of the module are the same. However, the call to the Data Acquisition/Reduction subroutine for scanning is replaced by a data-entry routine. Also, the results-computation subroutine is slightly altered.

In the data-entry subroutine, one percent 'transmittance' value from each of the three tristimulus filters is received. These data are converted to pseudo-tristimulus values by means of method equations.

In the results-computation subroutine, there is no need to compute the pseudo-tristimulus values, since they have already been either calculated in the data-entry subroutine or defined for the 'colorless' solution. The subroutine begins with the iterative scheme for computing the Munsell Values.

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE  1
                   PROGRAM LISTING FOR UVV0.L3

 1234567891123456789212345678931234567894123456789512345678961234567897
          0         0         0         0         0         0         0
 0010 REM           ++++++++++++++++++++++++++++++++++++++++
 0020 REM           +    AUTOMATED  ULTRAVIOLET-VISIBLE    +
 0030 REM           +       SPECTROPHOTOMETER SYSTEM       +
 0040 REM           +        MANUAL  COLOR  SAMPLE         +
 0050 REM           +        ANALYSIS MOD: UVV0.L3         +
 0060 REM           +    WRITTEN BY GREG ROTH  (6/16/80)   +
 0070 REM           +    UNIV. OF CINCI. COMPUTER CENTER   +
 0080 REM           +    (UVV0.L3 IS SUB-MODULE OF MANU-   +
 0090 REM           +    AL COLOR ANALYSIS MOD: UVV0.L0)   +
 0100 REM           ++++++++++++++++++++++++++++++++++++++++
 0110 REM
 0120 REM
 0130 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 0140 REM                    PROGRAM INITIALIZATION
 0150 REM
 0160 REM ----------  SET PAGE/ESC/ROUTE-FLAG
 0170 PAGE =72
 0180 ON ESC THEN GOTO 0490
 0190 LET F5=0
 0200 ESC
 0210 REM ---------- DIM/INIT STRING VAR'S AND ARRAYS
 0220 DIM F0$[13],F1$[13],F2$[13],F3$[13],N1$[20],N2$[20]
 0230 DIM A$[1],L$[72],R$[30],O$[12],I$[8],I0$[8],C1$[30]
 0240 DIM R0$[3],R1$[3]
 0250 DIM A1[6],M[6],U[6],S[6],M0[3],T[3],T1[3],F1[5]
 0260 LET R$="IN CONTROLWARNING   OUT OF CTL"
 0270 LET R0$="+++"
 0280 LET A1[1]=25
 0290 LET A1[2]=50
 0300 LET A1[3]=100
 0310 LET A1[4]=150
 0320 LET A1[5]=200
 0330 LET A1[6]=250
 0340 REM   [EPA CHEM METH'S "COLORLESS" TRIST. VALUES]
 0350 LET T1[1]=98.09
 0360 LET T1[2]=100
 0370 LET T1[3]=118.35
 0380 REM   [MUNSELL CONVERSION CONSTANTS]
 0390 LET T[1]=98.045
 0400 LET T[2]=100
 0410 LET T[3]=118.1
 0420 LET F1[1]=1.2219E-02

 1234567891123456789212345678931234567894123456789512345678961234567897
          0         0         0         0         0         0         0
```

```
^-!-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE  2
                   PROGRAM LISTING FOR UVV0.L3

 1234567891123456789212345678931234567894123456789512345678961234567897
          0         0         0         0         0         0         0
 0430 LET F1[2]=-2.3111E-03
 0440 LET F1[3]=2.3951E-03
 0450 LET F1[4]=-2.1009E-04
 0460 LET F1[5]=8.404E-06
 0470 GOTO 0540
 0480 REM ----------  ESCAPE DURING PROG. INIT.
 0490 NOESC
 0500 CLOSE
 0510 DIM F0$[13],F1$[13],F2$[13],F3$[13]
 0520 LET F5=1
 0530 REM ----------  RETRIEVE SYSTEM STATUS PARM'S
 0540 LET F0$="UVV00.TR"
 0550 OPEN FILE[0,0],F0$,21
 0560 READ FILE[0,1],F1$
 0570 READ FILE[0,2],F2$
 0580 READ FILE[0,3],F3$
 0590 READ FILE[0,4],N1$
 0600 READ FILE[0,5],N2$
 0610 CLOSE FILE[0]
 0620 REM   [MODIFY PROGRAM LOCATION VAR'S]
 0630 LET F1$=F2$
 0640 LET F2$=F3$
 0650 LET F3$=F1$
 0660 IF F5=1 THEN GOTO 3310
 0670 ON ESC THEN GOTO 3310
 0680 IF F1$="UVV0.L4" THEN LET F5=1
 0690 REM ----------  RETRIEVE COLOR STANDARDS DATA
 0700 LET F0$="UVV0L.SM"
 0710 OPEN FILE[3,0],F0$,36
 0720 READ FILE[3,0],K,J,U1,U2,U3
 0730 READ FILE[3,1],U[1],U[2],U[3],U[4],U[5],U[6]
 0740 READ FILE[3,2],S[1],S[2],S[3],S[4],S[5],S[6]
 0750 CLOSE FILE[3]
 0760 REM ---------- RETRIEVE BASIC DATA SUMMARY PARM'S
 0770 LET F0$="UVV0L.DS"
 0780 OPEN FILE[4,0],F0$,21
 0790 READ FILE[4,0],M0,N1,N2,P1
 0800 IF F5=1 THEN READ FILE[4,P1],M1,M2,M3
 0810 CLOSE FILE[4]
 0820 IF M0=1 THEN LET O$="UPDATE STNDS"
 0830 IF M0=2 THEN LET O$="CHECK STND"
 0840 IF M0=3 THEN LET O$="UNKNOWN"

 1234567891123456789212345678931234567894123456789512345678961234567897
          0         0         0         0         0         0         0
```

```
A-U-T-´-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE  3
                     PROGRAM LISTING FOR UVV0.L3

 1234567891123456789212345678931234567894123456789512345678961234567897
          0         0         0         0         0         0         0
0850 IF F5=1 THEN ON M0 THEN GOTO 1000, 1430, 1430
0860 REM   [COMPUTE MUNSELL RENOTATIONS FOR 100%T]
0870 FOR I=1 TO 3
0880   LET M0[I]=T1[I]
0890 NEXT I
0900 LET F5=0
0910 GOSUB 3660
0920 ON ESC THEN GOTO 3310
0930 IF F5=0 THEN GOTO 3310
0940 LET M1=M0[1]
0950 LET M2=M0[2]
0960 LET M3=M0[3]
0970 IF M0>1 THEN GOTO 1610
0980 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0990 REM               PROCESS UPDATE STANDARDS
1000 FOR H=1 TO 6
1010   PRINT
1020   PRINT "FOR UPDATE STANDARD ADMI";A1[H];":"
1030   REM ----------  COLLECT/REDUCE DATA
1040   LET F5=0
1050   GOSUB 3460
1060   ON ESC THEN GOTO 3310
1070   IF F5=0 THEN GOTO 3310
1080   REM ----------  COMPUTE/DISPLAY RESULTS
1090   LET F5=0
1100   GOSUB 3660
1110   ON ESC THEN GOTO 3310
1120   IF F5=0 THEN GOTO 3310
1130   LET F5=0
1140   GOSUB 4210
1150   ON ESC THEN GOTO 3310
1160   IF F5=0 THEN GOTO 3310
1170   REM ----------  OPTIONAL RESULTS REJECTION
1180   ON ERR THEN GOTO 1260
1190   PRINT
1200   PRINT "REJECT RESULTS OF ADMI";A1[H];"SCAN ?";
1210   INPUT "  [N(CR) OR Y]  >>> ",A$
1220   ON ERR THEN STOP
1230   IF LEN(A$)=0 THEN GOTO 1300
1240   IF A$="N" THEN GOTO 1300
1250   IF A$="Y" THEN GOTO 1010
1260   ON ERR THEN STOP

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-´-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE  4
                     PROGRAM LISTING FOR UVV0.L3

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
1270   PRINT "<7>"
1280   GOTO 1180
1290   REM ----------  STORE RESULTS
1300   LET M[H]=D
1310 NEXT H
1320 LET F0$="UVV0L.SM"
1330 OPEN FILE[3,0],F0$,36
1340 WRITE FILE[3,10],M[1],M[2],M[3],M[4],M[5],M[6]
1350 CLOSE FILE[3]
1360 NOESC
1370 CLOSE
1380 LET F3$="UVV0.L6"
1390 GOTO 3350
1400 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
1410 REM            COLOR CHECK STND/UNKNOWN OPTION-SELECT
1420 REM
1430 ON ESC THEN GOTO 3310
1440 ESC
1450 ON ERR THEN GOTO 1530
1460 PRINT
1470 PRINT "SELECT:"
1480 PRINT " ANOTHER ";O$;"[1], ";O$;"S REPORT[2], OR ";
1490 INPUT "CONTINUE[3(CR)] >> ",A$
1500 ON ERR THEN STOP
1510 IF LEN(A$)=0 THEN LET A$="3"
1520 ON POS("123",A$,1) THEN GOTO 1610, 3150, 3310
1530 ON ERR THEN STOP
1540 PRINT "<7>"
1550 PRINT "PLEASE ENTER 1, 2, OR 3."
1560 GOTO 1450
1570 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
1580 REM            CHECK STANDARD / UNKNOWN PROCESS SECTION
1590 REM
1600 REM ----------  GET/SET I.D.
1610 ON ESC THEN GOTO 3090
1620 ON ERR THEN GOTO 1690
1630 PRINT
1640 PRINT O$;" ID:  [USER-SET OR AUTOMATIC(CR)]";
1650 INPUT "  >>> ",I0$
1660 ON ERR THEN STOP
1670 IF LEN(I0$)>0 THEN GOTO 1830
1680 GOTO 1730

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                       PAGE  5
                     PROGRAM LISTING FOR UVV0.L3

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
1690 ON ERR THEN STOP
1700 PRINT "<7>"
1710 GOTO 1620
1720 REM   [AUTOMATIC-SET I.D.]
1730 LET I$=O$[1,1],"0000000"
1740 LET I0$=STR$(SYS(2))
1750 LET I$[4-LEN(I0$),3]=I0$
1760 LET I0$=STR$(SYS(1))
1770 LET I$[6-LEN(I0$),5]=I0$
1780 IF M0=2 THEN LET I0$=STR$(N1+1)
1790 IF M0=3 THEN LET I0$=STR$(N2+1)
1800 LET I$[9-LEN(I0$),8]=I0$
1810 GOTO 1900
1820 REM   [USER-SET I.D.]
1830 LET K=LEN(I0$)
1840 FOR I=1 TO K
1850   IF I0$[I,I]=" " THEN LET I0$[I,I]="0"
1860 NEXT I
1870 LET I$="00000000"
1880 LET I$[9-LEN(I0$),8]=I0$
1890 REM   [VERIFY I.D.]
1900 ON ERR THEN GOTO 1970
1910 PRINT
1920 PRINT O$;" ID: ";I$;
1930 INPUT "  [KEEP(CR) OR CHANGE]  >>> ",I0$
1940 ON ERR THEN STOP
1950 IF LEN(I0$)>0 THEN GOTO 1830
1960 GOTO 2010
1970 ON ERR THEN STOP
1980 PRINT "<7>"
1990 GOTO 1900
2000 REM   [CHECK FOR I.D. REPETITION]
2010 LET F0$="UVVOL.DS"
2020 OPEN FILE[4,0],F0$,21
2030 LET J=1
2040 FOR I=1 TO (N1+N2)
2050   READ FILE[4,J],K,I0$,D,L
2060   IF I$=I0$ THEN GOTO 2110
2070   LET J=J+1+(K-2)*L
2080 NEXT I
2090 CLOSE FILE[4]
2100 ON (M0-1) THEN GOTO 2160, 2520

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-F-R  S-Y-S-T-E-M
9/2/1980                                                       PAGE  6
                     PROGRAM LISTING FOR UVV0.L3

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2110 CLOSE FILE[4]
2120 PRINT "<7>"
2130 PRINT O$;" ID ";I$;" ALREADY EXISTS."
2140 GOTO 1620
2150 REM   [GET CHECK STND ADMI]
2160 ON ERR THEN GOTO 2270
2170 PRINT
2180 PRINT "SELECT ";O$;" TYPE  [1-6 OR H(CR)]";
2190 INPUT "  >>> ",A$
2200 ON ERR THEN STOP
2210 IF LEN(A$)=0 THEN GOTO 2430
2220 IF A$="H" THEN GOTO 2430
2230 ON ERR THEN GOTO 2270
2240 LET A0=VAL(A$)
2250 ON ERR THEN STOP
2260 IF A0>=1 THEN IF A0<=6 THEN IF A0=INT(A0) THEN GOTO 2310
2270 ON ERR THEN STOP
2280 PRINT "<7>"
2290 PRINT "PLEASE ENTER SINGLE NUMBER OR TYPE H(CR)."
2300 GOTO 2160
2310 ON ERR THEN GOTO 2390
2320 PRINT
2330 PRINT O$;" ";I$;" IS ADMI ";STR$(A1[A0]);".";
2340 INPUT "   CHANGE ?  [N(CR) OR Y]  >>> ",A$
2350 ON ERR THEN STOP
2360 IF LEN(A$)=0 THEN GOTO 2630
2370 IF A$="N" THEN GOTO 2630
2380 IF A$="Y" THEN GOTO 2160
2390 ON ERR THEN STOP
2400 PRINT "<7>"
2410 GOTO 2310
2420 REM   [(LIST #S & ADMI'S)]
2430 FOR I=1 TO 4 STEP 3
2440   PRINT
2450   FOR J=0 TO 2
2460     PRINT "   ";STR$(I+J);" -- ADMI ";
2470     PRINT STR$(A1[I+J]);";";
2480   NEXT J
2490 NEXT I
2500 GOTO 2160
2510 REM   [GET UNKNOWN COMMENT]
2520 ON ERR THEN GOTO 2600

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE  7
                   PROGRAM LISTING FOR UVV0.L3

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2530 PRINT
2540 PRINT "COMMENT FOR UNKNOWN:        ";C1$
2550 INPUT "  [KEEP(CR) OR CHANGE]  >>> ",L$
2560 ON ERR THEN STOP
2570 IF LEN(L$)=0 THEN GOTO 2630
2580 LET C1$=L$[1,30]
2590 GOTO 2520
2600 ON ERR THEN STOP
2610 PRINT "<7>"
2620 GOTO 2520
2630 PRINT
2640 PRINT "FOR ";O$;" ";I$;":"
2650 REM ----------  COLLECT/REDUCE DATA
2660 LET F5=0
2670 GOSUB 3460
2680 ON ESC THEN GOTO 3090
2690 IF F5=0 THEN GOTO 3090
2700 REM ----------  COMPUTE/DISPLAY RESULTS
2710 LET F5=0
2720 GOSUB 3660
2730 ON ESC THEN GOTO 3090
2740 IF F5=0 THEN GOTO 3090
2750 LET F5=0
2760 ON (M0-1) THEN GOSUB 3930, 4130
2770 ON ESC THEN GOTO 3090
2780 IF F5=0 THEN GOTO 3090
2790 REM ----------  OPTIONAL RESULTS REJECTION
2800 ON ERR THEN GOTO 2880
2810 PRINT
2820 PRINT "REJECT RESULTS FOR ";O$;" ";I$;
2830 INPUT " ?  [N(CR) OR Y]  >>> ",A$
2840 ON ERR THEN STOP
2850 IF LEN(A$)=0 THEN GOTO 2910
2860 IF A$="N" THEN GOTO 2910
2870 IF A$="Y" THEN GOTO 3090
2880 ON ERR THEN STOP
2890 PRINT "<7>"
2900 GOTO 2800
2910 LET F0$="UVV0L.DS"
2920 OPEN FILE[4,0],F0$,21
[illegible] IF M0=3 THEN GOTO 3000
2940 REM   [FOR CHECK STANDARD]

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE  8
                   PROGRAM LISTING FOR UVV0.L3

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2950 WRITE FILE[4,P1],M0,I$,A1[A0],D
2960 LET N1=N1+1
2970 LET P1=P1+1
2980 GOTO 3060
2990 REM   [FOR UNKNOWNS]
3000 LET J=INT((LEN(C1$)+14)/15)
3010 WRITE FILE[4,P1],M0,I$,D,J
3020 IF J>=1 THEN WRITE FILE[4,P1+1],C1$[1,15]
3030 IF J=2 THEN WRITE FILE[4,P1+2],C1$[16]
3040 LET N2=N2+1
3050 LET P1=P1+1+J
3060 WRITE FILE[4,0],M0,N1,N2,P1
3070 CLOSE FILE[4]
3080 REM ----------  ESCAPE DURING OR RETURN TO OPT-SELECT
3090 NOESC
3100 CLOSE
3110 GOTO 1430
3120 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
3130 REM    INTERMEDIATE COLOR CS/UNKNOWNS ANALYSIS REPORT SECTION
3140 REM
3150 ON ESC THEN GOTO 3250
3160 LET F0$="UVV0L.DS"
3170 OPEN FILE[4,0],F0$,21
3180 READ FILE[4,0],M0,N1,N2,P1
3190 WRITE FILE[4,P1],M1,M2,M3
3200 NOESC
3210 CLOSE
3220 LET F3$="UVV0.L4"
3230 GOTO 3350
3240 REM ----------  ESCAPE BEFORE REPORT PREP.
3250 NOESC
3260 CLOSE
3270 GOTO 1430
3280 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
3290 REM            COLOR CS/UNKNOWNS ANALYSIS ENDING SECTION
3300 REM
3310 NOESC
3320 CLOSE
3330 LET F3$="UVV0.L0"
3340 REM ----------  EXIT POINT
3350 LET F0$="UVV00.TR"
3360 OPEN FILE[0,0],F0$,21

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                      PAGE  9
                    PROGRAM LISTING FOR UVV0.L3

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
3370 WRITE FILE[0,1],F1$
3380 WRITE FILE[0,2],F2$
3390 WRITE FILE[0,3],F3$
3400 CLOSE FILE[0]
3410 CHAIN F3$
3420 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
3430 REM                       SUBROUTINES
3440 REM
3450 REM ----------  DATA COLLECTION/REDUCTION SUBRT.
3460 ON ESC THEN RETURN
3470 PRINT  TAB(9);" FILTER    %TRANSM."
3480 PRINT  TAB(9);"--------   --------"
3490 LET L$="RED GRN BLUE"
3500 FOR I=1 TO 3
3510   ON ERR THEN GOTO 3560
3520   PRINT  TAB(9);STR$(I);" - ";L$[I*4-3,I*4];
3530   INPUT "     ",MO[I]
3540   ON ERR THEN STOP
3550   GOTO 3590
3560   ON ERR THEN STOP
3570   PRINT "<7>"
3580   GOTO 3510
3590 NEXT I
3600 REM   [COMPUTE TRISTIMULUS VALUES]
3610 LET MO[1]=(.1899*MO[3])+(.791*MO[1])
3620 LET MO[3]=1.1835*MO[3]
3630 LET F5=1
3640 RETURN
3650 REM ----------  RESULTS-COMPUTATION SUBRT.
3660 ON ESC THEN RETURN
3670 REM   [CONVERT TRISTIMULUS VALUES TO MUNSELL RENOTATIONS]
3680 FOR I=1 TO 3
3690   LET TO=MO[I]/T[I]
3700   IF TO<0 THEN LET TO=0
3710   LET V1=10*SQR(TO)
3720   FOR J=1 TO 15
3730     LET V2=V1
3740     LET V3=0
3750     LET V4=0
3760     FOR L=1 TO 5
3770       LET V3=V3+F1[L]*V1^L
3780       LET V4=V4+(F1[L]*L)*V1^(L-1)

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                      PAGE 10
                    PROGRAM LISTING FOR UVV0.L3

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
3790       NEXT L
3800       LET V1=V1-((V3-TO)/V4)
3810       IF ABS(V2-V1)<1E-07 THEN GOTO 3830
3820     NEXT J
3830     LET MO[I]=V1
3840 NEXT I
3850 REM   [COMPUTE DE NUMBER]
3860 LET D=(.23*(M2-MO[2]))^2
3870 LET D=D+(M1-M2-MO[1]+MO[2])^2
3880 LET D=SQR(D+(.4*(M2-M3-MO[2]+MO[3]))^2)
3890 LET A=U1+D*(U2+D*U3)
3900 LET F5=1
3910 RETURN
3920 REM ----------  CHECK STNDS RESULTS-DISPLAY SUBRT.
3930 ON ESC THEN RETURN
3940 LET S2=S[A0]+S[A0]
3950 LET E=ABS(U[A0]-D)
3960 IF E>(S[A0]+S2) THEN LET R0=2
3970 IF E>=S2 THEN IF E<=(S[A0]+S2) THEN LET R0=1
3980 IF E<S2 THEN LET R0=0
3990 LET L$="STANDARD>> MEAN DE[A] OF ADMI ###: "
4000 LET L$=L$,"-#.####   STND DEV OF MEAN: -#.####"
4010 PRINT
4020 PRINT "FOR CHECK STANDARD ";I$
4030 PRINT USING L$,A1[A0],U[A0],S[A0]
4040 LET L$="MEASURED>> DE[B]: -#.####"
4050 PRINT USING L$,D;
4060 LET L$="-#.####   CTL RAT'G: ##########"
4070 PRINT "  DIFF[A-B]: ";
4080 PRINT USING L$,(U[A0]-D),R$[(R0*10)+1,(R0+1)*10]
4090 PRINT USING "COMPUTED>> ADMI:---#.###",A
4100 LET F5=1
4110 RETURN
4120 REM ---------- UNKNOWNS RESULTS-DISPLAY SUBRT.
4130 ON ESC THEN RETURN
4140 LET L$="FOR UNKNOWN ########    MEASURED DE: "
4150 LET L$=L$,"-#.####   COMPUTED ADMI:----#.###"
4160 PRINT
4170 PRINT USING L$,I$,D,A
4180 LET F5=1
4190 RETURN
4200 REM ----------  UPDATE STNDS RESULTS-DISPLAY SUBRT.

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                                         PAGE 11 9/2/1980                                                         PAGE 12
                       PROGRAM LISTING FOR UVV0.L3                                                   SYMBOL TABLE FOR UVV0.L3

1234567891123456789212345678931234567894123456789512345678961234567897  SYMBOL   REFERENCES
         0         0         0         0         0         0         0  ------  ---------------------------------------------------------------
4210 ON ESC THEN RETURN                                                   0490  0180
4220 LET S2=S[H]+S[H]                                                     0540  0470
4230 LET E=ABS(U[H]-D)                                                    1000  0850
4240 IF E>(S[H]+S2) THEN LET R0=2                                         1010  1250
4250 IF E>=S2 THEN IF E<=(S[H]+S2) THEN LET R0=1                          1180  1280
4260 IF E<S2 THEN LET R0=0                                                1260  1180
4270 LET L$="STANDARD>> MEAN DE[A] OF ADMI ###: -#.#### "                 1300  1230  1240
4280 LET L$=L$,"  STND DEV OF MEAN: -#.####"                              1430  0850  3110  3270
4290 PRINT                                                                1450  1560
4300 PRINT USING L$,A1[H],U[H],S[H]                                       1530  1450
4310 LET L$="MEASURED>> DE[B]: -#.####"                                   1610  0970  1520
4320 PRINT USING L$,D;                                                    1620  1710  2140
4330 LET L$="-#.####   CTL RAT'G: ##########"                             1690  1620
4340 PRINT "  DIFF[A-B]: ";                                               1730  1680
4350 PRINT USING L$,(U[H]-D),R$[(R0*10)+1,(R0+1)*10]                      1830  1670  1950
4360 LET F5=1                                                             1900  1810  1990
4370 RETURN                                                               1970  1900
                                                                          2010  1960
                                                                          2110  2060
                                                                          2160  2100  2300  2380  2500
                                                                          2270  2160  2230
                                                                          2310  2260  2410
                                                                          2390  2310
                                                                          2430  2210  2220
                                                                          2520  2100  2590  2620
                                                                          2600  2520
                                                                          2630  2360  2370  2570
                                                                          2800  2900
                                                                          2880  2800
                                                                          2910  2850  2860
                                                                          3000  2930
                                                                          3060  2980
                                                                          3090  1610  2680  2690  2730  2740  2770  2780  2870
                                                                          3150  1520
                                                                          3250  3150
                                                                          3310  0660  0670  0920  0930  1060  1070  1110  1120  1150  1160
                                                                                1430  1520
                                                                          3350  1390  3230
                                                                          3460  1050  2670
                                                                          3510  3580
                                                                          3560  3510
                                                                          3590  3550
                                                                          3660  0910  1100  2720
1234567891123456789212345678931234567894123456789512345678961234567897    3830  3810
         0         0         0         0         0         0         0    3930  2760
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE 13
                        SYMBOL TABLE FOR UVV0.L3

SYMBOL    REFERENCES
------  ------------------------------------------------------------------
 4130   2760
 4210   1140
 A      3890  4090  4170
 A$     0230  1210  1230  1240  1250  1490  1510  1520  2190  2210
        2220  2240  2340  2360  2370  2380  2830  2850  2860  2870
 A0     2240  2260  2330  2950  3940  3950  3960  3970  4030  4080
 A1[    0250  0280  0290  0300  0310  0320  0330  1020  1200  2330
        2470  2950  4030  4300
 C1$    0230  2540  2580  3000  3020  3030
 D      1300  2050  2950  3010  3860  3870  3880  3890  3950  4050
        4080  4170  4230  4320  4350
 E      3950  3960  3970  3980  4230  4240  4250  4260
 F0$    0220  0510  0540  0550  0700  0710  0770  0780  1320  1330
        2010  2020  2910  2920  3160  3170  3350  3360
 F1$    0220  0510  0560  0630  0650  0680  3370
 F1[    0250  0420  0430  0440  0450  0460  3770  3780
 F2$    0220  0510  0570  0630  0640  3380
 F3$    0220  0510  0580  0640  0650  1380  3220  3330  3390  3410
 F5     0190  0520  0660  0680  0800  0850  0900  0930  1040  1070
        1090  1120  1130  1160  2660  2690  2710  2740  2750  2780
        3630  3900  4100  4180  4360
 FL#0   0550  0560  0570  0580  0590  0600  0610  3360  3370  3380
        3390  3400
 FL#3   0710  0720  0730  0740  0750  1330  1340  1350
 FL#4   0780  0790  0810  2020  2050  2090  2110  2920  2950  3010
        3060  3070  3170  3180  3190
 H      1000  1020  1200  1300  1310  4220  4230  4240  4250  4300
        4350
 I      0870  0880  0890  1840  1850  1860  2040  2080  2430  2460
        2470  2490  3500  3520  3530  3590  3680  3690  3830  3840
 I$     0230  1730  1750  1770  1800  1870  1880  1920  2060  2130
        2330  2640  2820  2950  3010  4020  4170
 I0$    0230  1650  1670  1740  1750  1760  1770  1780  1790  1800
        1830  1850  1880  1930  1950  2050  2060
 J      0720  2030  2050  2070  2450  2460  2470  2480  3000  3010
        3020  3030  3050  3720  3820
 K      0720  1830  1840  2050  2070
 L      2050  2070  3760  3770  3780  3790
 L$     0230  2550  2570  2580  3490  3520  3990  4000  4030  4040
        4050  4060  4080  4140  4150  4170  4270  4280  4300  4310
        4320  4330  4350
 M0     0790  0820  0830  0840  0850  0970  1780  1790  2100  2760
        2930  2950  3010  3060  3180
 M0[    0250  0880  0940  0950  0960  3530  3610  3620  3690  3830
        3860  3870  3880
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                        PAGE 14
                        SYMBOL TABLE FOR UVV0.L3

SYMBOL    REFERENCES
------  ------------------------------------------------------------------
 M1     0800  0940  3190  3870
 M2     0800  0950  3190  3860  3870  3880
 M3     0800  0960  3190  3880
 M[     0250  1300  1340
 N1     0790  1780  2040  2960  3060  3180
 N1$    0220  0590
 N2     0790  1790  2040  3040  3060  3180
 N2$    0220  0600
 O$     0230  0820  0830  0840  1480  1640  1730  1920  2130  2180
        2330  2640  2820
 P1     0790  0800  2950  2970  3010  3020  3030  3050  3060  3180
        3190
 R$     0230  0260  4080  4350
 R0     3960  3970  3980  4080  4240  4250  4260  4350
 R0$    0240  0270
 R1$    0240
 S2     3940  3960  3970  3980  4220  4240  4250  4260
 S[     0250  0740  3940  3960  3970  4030  4220  4240  4250  4300
 T0     3690  3700  3710  3800
 T1[    0250  0350  0360  0370  0880
 T[     0250  0390  0400  0410  3690
 U1     0720  3890
 U2     0720  3890
 U3     0720  3890
 U[     0250  0730  3950  4030  4080  4230  4300  4350
 V1     3710  3730  3770  3780  3800  3810  3830
 V2     3730  3810
 V3     3740  3770  3800
 V4     3750  3780  3800
```

COLOR UPDATE STANDARDS ANALYSIS REPORT/UPDATE MODULE -- UVVO.L6

UVVO.L6 is chained to from either the automated or manual color sample analysis module (UVVO.L2 and UVVO.L3). Corresponding to these chained-from programs, the "destination" program is defined as either UVVO.L1 or UVVO.LO, and the color historical standards file is defined as either UVVOL.SF or UVVOL.SM.

In program initialization, the escape condition is set to ensure a speedy return to the "destination" program. Also, the basic standards statistics are retrieved, as well as the DE number of the present set of update standards.

The first section is an optional report generation procedure. Note that the present update standards are evaluated in relation to the statistics and equation of the past accumulated sets of standards. Once the report is ready, options are presented for terminal output, lineprinter output, and continuance of the update standards analysis.

The next section offers optional acceptance/rejection of the results. Should the update standards be rejected, program control drops to the exit point. Otherwise, the update begins by transferral of the new DE's and analysis date to the next available record of the color analysis historical standards file. (The six records open for sets of standards data are filled in a cyclic manner, that is, 4,5...,9,4,...etc.) The number of sets of standards is incremented (never exceeding six), and the pointer to the oldest set of standards is modified.

From the new sets of standards, the means, standard deviations, and percent relative standard deviations are computed and written into the standards file. Next, a new standards curve is derived by means of a quadratic regression algorithm. The computed constants of this equation, along with the true and percent relative standard errors of estimate, are stored in the standards file. A message of the update completion is issued.

The final section is the program exit point. The modified program location variables are written to the system status transfer file, and a chain is made to the "destination" program.

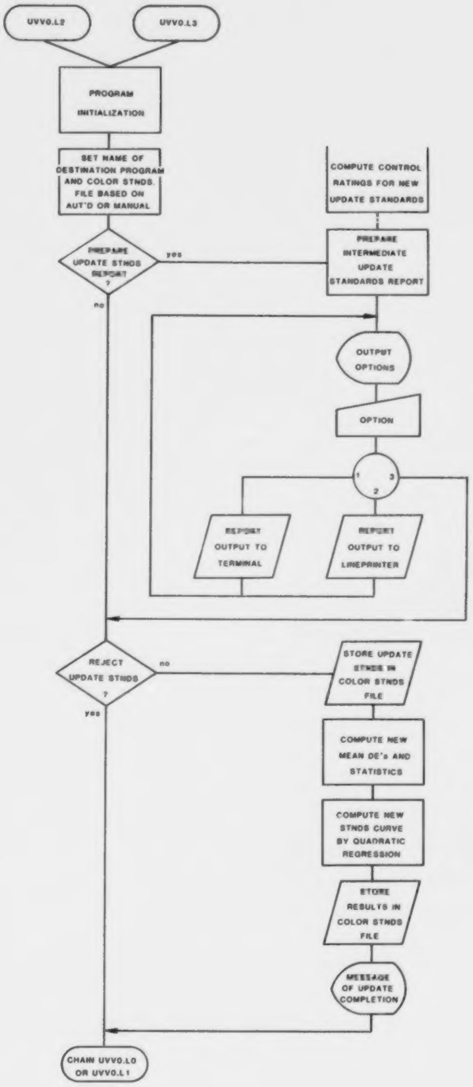

UVV0.L2
UVV0.L3
PROGRAM INITIALIZATION
SET NAME OF DESTINATION PROGRAM AND COLOR STNDS. FILE BASED ON AUT'O OR MANUAL
PREPARE UPDATE STNDS REPORT ?
yes
no
COMPUTE CONTROL RATINGS FOR NEW UPDATE STANDARDS
PREPARE INTERMEDIATE UPDATE STANDARDS REPORT
OUTPUT OPTIONS
OPTION
1
2
3
REPORT OUTPUT TO TERMINAL
REPORT OUTPUT TO LINEPRINTER
REJECT UPDATE STNDS ?
no
yes
STORE UPDATE STNDS IN COLOR STNDS FILE
COMPUTE NEW MEAN DE's AND STATISTICS
COMPUTE NEW STNDS CURVE BY QUADRATIC REGRESSION
STORE RESULTS IN COLOR STNDS FILE
MESSAGE OF UPDATE COMPLETION
CHAIN UVV0.L0 OR UVV0.L1

Figure 17. Flowchart of module UVV0.L6.

TABLE 24. VARIABLE DESCRIPTIONS FOR MODULE UVV0.L6

A$	a single character user-response variable
A1()	the ADMI values of the six APHA standards
B$	a character string composed of blanks
C()	the matrix used in the quadratic regression of the standards curve
E	the absolute value difference between mean standard and measured DE numbers
F0$	a file name variable
F1$, F2$, F3$	program location variables; see Table 1
F4$	the color analysis historical standards file name
F5	a flag used during program initialization
I, J, K, K1, K2, L	loop counter and general purpose variables
L$	an output and output format character string
M()	the new/old update standards DEs
N1$, N2$	the analyst's and instrument's names
R0	a control rating indicator
R0$, R1$	output character strings used for control ratings
S()	the standard deviations of the standards mean DE's
S0, S1	the actual and percent relative standard errors of estimate
S2	two times the standard deviation of a standard mean DE
U1, U2, U3	the constants of the standards curve
U()	the mean DEs of the six APHA standards
W$	a control character in each output list file record

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/3/1980                                                     PAGE  1
                    PROGRAM LISTING FOR UVV0.L6

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0010 REM            +++++++++++++++++++++++++++++++++++++++
0020 REM            +    AUTOMATED  ULTRAVIOLET-VISIBLE    +
0030 REM            +      SPECTROPHOTOMETER SYSTEM       +
0040 REM            +     COLOR UPDATE STNDS ANALYSIS     +
0050 REM            +    REPORT/UPDATE MODULE: UVV0.L6    +
0060 REM            +    WRITTEN BY GREG ROTH  (6/5/80)   +
0070 REM            +    UNIV. OF CINCI. COMPUTER CENTER  +
0080 REM            +    (UVV0.L6 IS SUB-MODULE OF AUT'D  +
0090 REM            +    AND MANUAL COLOR SAMPLE ANALY-   +
0100 REM            +    SIS MODULES: UVV0.L2 & UVV0.L3)  +
0110 REM            +++++++++++++++++++++++++++++++++++++++
0120 REM
0130 REM
0140 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0150 REM                   PROGRAM INITIALIZATION
0160 REM
0170 REM ----------  SET PAGE/ESC/ROUTE-FLAG
0180 PAGE =72
0190 ON ESC THEN GOTO 0380
0200 LET F5=0
0210 ESC
0220 REM ---------- DIM/INIT STRING VAR'S AND ARRAYS
0230 DIM F0$[13],F1$[13],F2$[13],F3$[13],F4$[13],N1$[20],N2$[20]
0240 DIM A$[1],L$[72],W$[1],B$[30],R0$[3],R1$[3]
0250 DIM A1[6],M[6],U[6],S[6],C[3,4]
0260 FOR I=1 TO 30
0270   LET B$[I,I]=" "
0280 NEXT I
0290 LET R0$="***"
0300 LET A1[1]=25
0310 LET A1[2]=50
0320 LET A1[3]=100
0330 LET A1[4]=150
0340 LET A1[5]=200
0350 LET A1[6]=250
0360 GOTO 0430
0370 REM ----------  ESCAPE DURING PROG. INIT.
0380 NOESC
0390 CLOSE
0400 DIM F0$[13],F1$[13],F2$[13],F3$[13]
0410 LET F5=1
0420 REM ----------  RETRIEVE SYSTEM STATUS PARM'S

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/3/1980                                                     PAGE  2
                    PROGRAM LISTING FOR UVV0.L6

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0430 LET F0$="UVV00.TR"
0440 OPEN FILE[0,0],F0$,21
0450 READ FILE[0,1],F1$
0460 READ FILE[0,2],F2$
0470 READ FILE[0,3],F3$
0480 READ FILE[0,4],N1$
0490 READ FILE[0,5],N2$
0500 CLOSE FILE[0]
0510 REM   [MODIFY PROGRAM LOCATION VAR'S]
0520 LET F1$=F2$
0530 LET F2$=F3$
0540 IF F1$="UVV0.L2" THEN LET F3$="UVV0.L1"
0550 IF F1$="UVV0.L3" THEN LET F3$="UVV0.L0"
0560 IF F5=1 THEN GOTO 3160
0570 REM   [SET COLOR STNDS DATA FILE NAME]
0580 ON ESC THEN GOTO 3160
0590 IF F1$="UVV0.L2" THEN LET F4$="UVV0L.SF"
0600 IF F1$="UVV0.L3" THEN LET F4$="UVV0L.SM"
0610 REM ----------  RETRIEVE COLOR STANDARDS DATA
0620 OPEN FILE[3,0],F4$,36
0630 READ FILE[3,0],K,J,U1,U2,U3,S0,S1
0640 READ FILE[3,1],U[1],U[2],U[3],U[4],U[5],U[6]
0650 READ FILE[3,2],S[1],S[2],S[3],S[4],S[5],S[6]
0660 READ FILE[3,10],M[1],M[2],M[3],M[4],M[5],M[6]
0670 CLOSE FILE[3]
0680 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0690 REM                 OPTIONAL UPDATE STANDARDS REPORT
0700 REM
0710 ON ERR THEN GOTO 0780
0720 PRINT
0730 INPUT "PREPARE UPDATE STANDARDS REPORT ?  [N(CR) OR Y]  >>> ",A$
0740 ON ERR THEN STOP
0750 IF LEN(A$)=0 THEN GOTO 2050
0760 IF A$="N" THEN GOTO 2050
0770 IF A$="Y" THEN GOTO 0830
0780 ON ERR THEN STOP
0790 PRINT "<7>"
0800 GOTO 0710
0810 REM ----------  PREPARE/OUTPUT REPORT
0820 REM   [REPORT PREPARATION]
0830 LET F0$="UVVLPT"
0840 OPEN FILE[7,1],F0$

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/3/1980                                                          PAGE  3
                     PROGRAM LISTING FOR UVVO.L6

 123456789112345678921234567893123456789412345678951234567896123456789 7
          0         0         0         0         0         0         0
 0850 LET L$="<<<<<<<<<<<<<<<<<<<<<<<<     UVVIS  COLOR  "
 0860 LET L$=L$,"ANALYSIS   >>>>>>>>>>>>>>>>>>>>>>>>>"
 0870 PRINT FILE[7]
 0880 PRINT FILE[7],L$
 0890 LET L$[22,48]="  UPDATE  STANDARDS  REPORT"
 0900 PRINT FILE[7],L$
 0910 LET L$=B$[1,20],"DATE/TIME:  "
 0920 LET L$=L$,STR$(SYS(2)),"/",STR$(SYS(1)),"/"
 0930 LET L$=L$,STR$(SYS(3)-INT(SYS(3)/100)*100)
 0940 LET I=SYS(11)
 0950 LET J=SYS(12)
 0960 LET K=I-INT(I/13)*12
 0970 LET L$=L$,"  ",STR$(K),":"
 0980 IF J<10 THEN LET L$=L$,"0"
 0990 LET L$=L$,STR$(J)
 1000 IF I>=12 THEN LET L$=L$," P.M."
 1010 IF I<12 THEN LET L$=L$," A.M."
 1020 PRINT FILE[7]
 1030 PRINT FILE[7],L$
 1040 LET L$="ANALYST: ",N1$
 1050 LET I=LEN(N2$)+12
 1060 FOR J=1 TO INT((71-I-LEN(L$))/30)
 1070   LET L$=L$,B$
 1080 NEXT J
 1090 LET L$=L$,B$[1,71-I-LEN(L$)]
 1100 LET L$=L$,"INSTRUMENT: ",N2$
 1110 PRINT FILE[7]
 1120 PRINT FILE[7],L$
 1130 LET L$="STANDARDS CALIBRATION EQUATION ---"
 1140 PRINT FILE[7]
 1150 PRINT FILE[7],L$
 1160 LET L$=B$[1,10],"ADMI = -#.###^^^^ # (-#.###^^^^ * DE)"
 1170 LET L$=L$," # (-#.###^^^^ * DE^2)"
 1180 PRINT FILE[7],USING L$,U1,"+",U2,"+",U3
 1190 LET L$=B$[1,9],"[STANDARD ERROR OF ESTIMATE(SEE):---#.###"
 1200 LET L$=L$,"    %REL SEE:--#.##]"
 1210 PRINT FILE[7],USING L$,S0,S1
 1220 LET L$="ADMI OF    DE OF MOST    MEAN DE          DE"
 1230 LET L$=L$,"       STANDARD    UPDATE"
 1240 PRINT FILE[7]
 1250 PRINT FILE[7],L$
 1260 LET L$="  APHA        RECENT        OF ALL     "

 123456789112345678921234567893123456789412345678951234567896123456789 7
          0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/3/1980                                                          PAGE  4
                     PROGRAM LISTING FOR UVVO.L6

 123456789112345678921234567893123456789412345678951234567896123456789 7
          0         0         0         0         0         0         0
 1270 LET L$=L$,"DIFFERENCE   DEV.  OF    CONTROL"
 1280 PRINT FILE[7],L$
 1290 LET L$="STANDARD   UPDATE [A]   STNDS. [B]    [A-B=D]"
 1300 LET L$=L$,"     MEAN  DE    RATING"
 1310 PRINT FILE[7],L$
 1320 LET L$="--------   ----------   ----------   "
 1330 LET L$=L$,"----------   --------   -------"
 1340 PRINT FILE[7],L$
 1350 LET L$="   ##       -#.####      -#.####"
 1360 LET L$=L$,"      -#.####      #.####        ###"
 1370 FOR I=1 TO 6
 1380   LET E=ABS(U[I]-M[I])
 1390   LET S2=S[I]+S[I]
 1400   IF E>(S[I]+S2) THEN LET R0=3
 1410   IF E>=S2 THEN IF E<=(S[I]+S2) THEN LET R0=2
 1420   IF E<S2 THEN LET R0=1
 1430   LET R1$=B$[1,3]
 1440   LET R1$[1,R0]=R0$[1,R0]
 1450   IF A1[I]>=100 THEN LET L$[3,3]="#"
 1460   PRINT FILE[7],USING L$,A1[I],M[I],U[I],(M[I]-U[I]),S[I],R1$
 1470 NEXT I
 1480 LET L$="NOTE: CONTROL RATINGS BASED ON ABSOLUTE "
 1490 LET L$=L$,"VALUE(D') OF DE DIFF(D) RELA-"
 1500 PRINT FILE[7]
 1510 PRINT FILE[7],L$
 1520 LET L$="TIVE TO STND DEV(S) OF STANDARDS MEAN "
 1530 LET L$=L$,"DE, SUCH THAT:  * --- IN CONTROL"
 1540 PRINT FILE[7],L$
 1550 LET L$="[D'<2S];  ** --- WARNING [2S<=D'<=3S];  "
 1560 LET L$=L$,"*** --- OUT OF CONTROL [D'>3S]."
 1570 PRINT FILE[7],L$
 1580 CLOSE FILE[7]
 1590 REM   [REPORT OUTPUT]
 1600 ON ESC THEN GOTO 3160
 1610 ESC
 1620 ON ERR THEN GOTO 1690
 1630 PRINT
 1640 PRINT "REPORT: TERMINAL[1], LINEPRINTER[2], OR ";
 1650 INPUT "CONTINUE[3(CR)]  >>> ",A$
 1660 ON ERR THEN STOP
 1670 IF LEN(A$)=0 THEN LET A$="3"
 1680 ON POS("123",A$,1) THEN GOTO 1740, 1820, 2050

 123456789112345678921234567893123456789412345678951234567896123456789 7
          0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/3/1980                                                          PAGE  5
                    PROGRAM LISTING FOR UVV0.L6

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
1690 ON ERR THEN STOP
1700 PRINT "<7>"
1710 PRINT "PLEASE 1, 2 OR 3."
1720 GOTO 1620
1730 REM   [(TERMINAL OUTPUT)]
1740 ON ESC THEN GOTO 1990
1750 OPEN FILE[7,3],F0$
1760 LREAD FILE[7],L$,W$
1770 IF EOF(7)=1 THEN GOTO 1990
1780 LET L$=L$,W$
1790 PRINT L$;
1800 GOTO 1760
1810 REM   [(LINEPRINTER OUTPUT)]
1820 ON ESC THEN GOTO 1990
1830 OPEN FILE[7,3],F0$
1840 ON ERR THEN GOTO 1920
1850 OPEN FILE[1,1],"$LPT"
1860 ON ERR THEN STOP
1870 LREAD FILE[7],L$,W$
1880 IF EOF(7)=1 THEN GOTO 1990
1890 PRINT FILE[1],B$[1,4];L$
1900 GOTO 1870
1910 REM   [(LINEPRINTER IN USE)]
1920 ON ERR THEN STOP
1930 CLOSE
1940 PRINT "<7>"
1950 PRINT "LINEPRINTER IN USE; WILL WAIT 10 SECS. & RETRY."
1960 DELAY =9
1970 GOTO 1820
1980 REM   [(ESCAPE DURING OR END OF OUTPUT)]
1990 NOESC
2000 CLOSE
2010 GOTO 1600
2020 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
2030 REM                  OPTIONAL RESULTS REJECTION
2040 REM
2050 ON ERR THEN GOTO 2120
2060 PRINT
2070 INPUT "REJECT UPDATE STANDARDS ?  [N(CR) OR Y]  >>> ",A$
2080 ON ERR THEN STOP
2090 IF LEN(A$)=0 THEN GOTO 2160
2100 IF A$="N" THEN GOTO 2160

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/3/1980                                                          PAGE  6
                    PROGRAM LISTING FOR UVV0.L6

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
 2110 IF A$="Y" THEN GOTO 3160
 2120 ON ERR THEN STOP
 2130 PRINT "<7>"
 2140 GOTO 2050
 2150 REM ----------  STORE UPDATE STANDARDS
 2160 OPEN FILE[3,0],F4$,36
 2170 READ FILE[3,0],K,J,U1,U2,U3,S0,S1
 2180 LET I=(J+K)-INT((J-1+K)/6)*6
 2190 WRITE FILE[3,I+3],M[1],M[2],M[3],M[4],M[5],M[6],SYS(2),SYS(1),SYS
*     (3)
 2200 LET J=J+INT(K/6)
 2210 LET J=J-INT((J-1)/6)*6
 2220 LET K=(K+1)-INT(K/6)
 2230 REM ----------  COMPUTE/STORE NEW MEANS & STND DEV'S
 2240 MAT U=ZER
 2250 MAT S=ZER
 2260 FOR I=0 TO (K-1)
 2270   READ FILE[3,J+I-INT((J+I-1)/6)*6+3],M[1],M[2],M[3],M[4],M[5],M[
*     6]
 2280   FOR L=1 TO 6
 2290     LET U[L]=I/(I+1)*U[L]+M[L]/(I+1)
 2300   NEXT L
 2310 NEXT I
 2320 FOR I=0 TO (K-1)
 2330   READ FILE[3,J+I-INT((J+I-1)/6)*6+3],M[1],M[2],M[3],M[4],M[5],M[
*     6]
 2340   FOR L=1 TO 6
 2350     LET S[L]=S[L]+(M[L]-U[L])^2
 2360   NEXT L
 2370 NEXT I
 2380 MAT M=ZER
 2390 IF K<=1 THEN MAT S=ZER
 2400 IF K<=1 THEN GOTO 2450
 2410 FOR L=1 TO 6
 2420   LET S[L]=SQR(S[L]/(K-1))
 2430   IF U[L]<>0 THEN LET M[L]=S[L]/U[L]*100
 2440 NEXT L
 2450 WRITE FILE[3,0],K,J,U1,U2,U3,S0,S1
 2460 WRITE FILE[3,1],U[1],U[2],U[3],U[4],U[5],U[6]
 2470 WRITE FILE[3,2],S[1],S[2],S[3],S[4],S[5],S[6]
 2480 WRITE FILE[3,3],M[1],M[2],M[3],M[4],M[5],M[6]
 2490 REM ----------  COMPUTE NEW STANDARDS EQUATION

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/3/1980                                                        PAGE  7
                     PROGRAM LISTING FOR UVV0.L6

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2500 MAT C=ZER
2510 LET K2=K
2520 LET K1=J
2530 FOR L=0 TO (K2-1)
2540   READ FILE[3,K1+L-INT((K1+L-1)/6)*6+3],U[1],U[2],U[3],U[4],U[5],
*     U[6]
2550   FOR I=1 TO 6
2560     FOR J=1 TO 3
2570       LET C[1,J]=C[1,J]+U[I]^(J-1)
2580       LET C[J,4]=C[J,4]+(A1[I]*U[I]^(J-1))
2590       IF J>1 THEN LET C[J,3]=C[J,3]+U[I]^(J+1)
2600     NEXT J
2610   NEXT I
2620 NEXT L
2630 FOR I=2 TO 3
2640   FOR J=1 TO 2
2650     LET C[I,J]=C[I-1,J+1]
2660   NEXT J
2670 NEXT I
2680 FOR I=1 TO 3
2690   FOR J=I TO 3
2700     IF C[I,J]<>0 THEN GOTO 2760
2710   NEXT J
2720   PRINT "<7>"
2730   PRINT "ERROR IN STANDARDS DATA REDUCTION;"
2740   PRINT "NO UNIQUE SOLUTION TO REGRESSION.<7>"
2750   GOTO 3160
2760   FOR K=1 TO 4
2770     LET L=C[I,K]
2780     LET C[I,K]=C[J,K]
2790     LET C[J,K]=L
2800   NEXT K
2810   LET L=0
2820   IF C[I,I]<>0 THEN LET L=1/C[I,I]
2830   FOR K=1 TO 4
2840     LET C[I,K]=L*C[I,K]
2850   NEXT K
2860   FOR J=1 TO 3
2870     IF J=I THEN GOTO 2920
2880     LET L=-C[J,I]
2890     FOR K=1 TO 4
2900       LET C[J,K]=C[J,K]+L*C[I,K]

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/3/1980                                                        PAGE  8
                     PROGRAM LISTING FOR UVV0.L6

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2910       NEXT K
2920     NEXT J
2930 NEXT I
2940 REM ----------  COMPUTE NEW STANDARD ERROR OF ESTIMATE[SEE]
2950 LET S1=0
2960 LET J=0
2970 FOR L=0 TO (K2-1)
2980   READ FILE[3,K1+L-INT((K1+L-1)/6)*6+3],U[1],U[2],U[3],U[4],U[5],
*     U[6]
2990   FOR I=1 TO 6
3000     LET S1=S1+A1[I]
3010     LET K=C[1,4]+U[I]*(C[2,4]+U[I]*C[3,4])
3020     LET J=J+(A1[I]-K)^2
3030   NEXT I
3040 NEXT L
3050 LET S0=SQR(J/(K2*6-3))
3060 LET S1=S0*100/(S1/(K2*6))
3070 REM ----------  STORE NEW STNDS EQUATION & SEE'S
3080 READ FILE[3,0],K,J
3090 WRITE FILE[3,0],K,J,C[1,4],C[2,4],C[3,4],S0,S1
3100 CLOSE FILE[3]
3110 PRINT
3120 PRINT "NEW STANDARDS DATA AND DATE STORED."
3130 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
3140 REM                           EXIT POINT
3150 REM
3160 NOESC
3170 CLOSE
3180 PRINT
3190 LET F0$="UVV00.TR"
3200 OPEN FILE[0,0],F0$,21
3210 WRITE FILE[0,1],F1$
3220 WRITE FILE[0,2],F2$
3230 WRITE FILE[0,3],F3$
3240 CLOSE FILE[0]
3250 CHAIN F3$

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/3/1980                                                         PAGE  9
                      SYMBOL TABLE FOR UVV0.L6

SYMBOL    REFERENCES
------   ---------------------------------------------------------------

 0380   0190
 0430   0360
 0710   0800
 0780   0710
 0830   0770
 1600   2010
 1620   1720
 1690   1620
 1740   1680
 1760   1800
 1820   1680   1970
 1870   1900
 1920   1840
 1990   1740   1770   1820   1880
 2050   0750   0760   1680   2140
 2120   2050
 2160   2090   2100
 2450   2400
 2760   2700
 2920   2870
 3160   0560   0580   1600   2110   2750
 A$     0240   0730   0750   0760   0770   1650   1670   1680   2070   2090
        2100   2110
 A1[    0250   0300   0310   0320   0330   0340   0350   1450   1460   2580
        3000   3020
 B$     0240   0270   0910   1070   1090   1160   1190   1430   1890
 C      2500
 C[     0250   2570   2580   2590   2650   2700   2770   2780   2790   2820
        2840   2880   2900   3010   3090
 E      1380   1400   1410   1420
 F0$    0230   0400   0430   0440   0830   0840   1750   1830   3190   3200
 F1$    0230   0400   0450   0520   0540   0550   0590   0600   3210
 F2$    0230   0400   0460   0520   0530   3220
 F3$    0230   0400   0470   0530   0540   0550   3230   3250
 F4$    0230   0590   0600   0620   2160
 F5     0200   0410   0560
 FL#0   0440   0450   0460   0470   0480   0490   0500   3200   3210   3220
        3230   3240
 FL#1   1850   1890
 FL#3   0620   0630   0640   0650   0660   0670   2160   2170   2190   2270
        2330   2450   2460   2470   2480   2540   2980   3080   3090   3100
 FL#7   0840   0870   0880   0900   1020   1030   1110   1120   1140   1150
        1180   1210   1240   1250   1280   1310   1340   1460   1500   1510
        1540   1570   1580   1750   1760   1830   1870
 I      0260   0270   0280   0940   0960   1000   1010   1050   1060   1090
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/3/1980                                                         PAGE 10
                      SYMBOL TABLE FOR UVV0.L6

SYMBOL    REFERENCES
------   ---------------------------------------------------------------

        1370   1380   1390   1400   1410   1450   1460   1470   2180   2190
        2260   2270   2290   2310   2320   2330   2370   2550   2570   2580
        2590   2610   2630   2650   2670   2680   2690   2700   2770   2780
        2820   2840   2870   2880   2900   2930   2990   3000   3010   3020
        3030
 J      0630   0950   0980   0990   1060   1080   2170   2180   2200   2210
        2270   2330   2450   2520   2560   2570   2580   2590   2600   2640
        2650   2660   2690   2700   2710   2780   2790   2860   2870   2880
        2900   2920   2960   3020   3050   3080   3090
 K      0630   0960   0970   2170   2180   2200   2220   2260   2320   2390
        2400   2420   2450   2510   2760   2770   2780   2790   2800   2830
        2840   2850   2890   2900   2910   3010   3020   3080   3090
 K1     2520   2540   2980
 K2     2510   2530   2970   3050   3060
 L      2280   2290   2300   2340   2350   2360   2410   2420   2430   2440
        2530   2540   2620   2770   2790   2810   2820   2840   2880   2900
        2970   2980   3040
 L$     0240   0850   0860   0880   0890   0900   0910   0920   0930   0970
        0980   0990   1000   1010   1030   1040   1060   1070   1090   1100
        1120   1130   1150   1160   1170   1180   1190   1200   1210   1220
        1230   1250   1260   1270   1280   1290   1300   1310   1320   1330
        1340   1350   1360   1450   1460   1480   1490   1510   1520   1530
        1540   1550   1560   1570   1760   1780   1790   1870   1890
 M      2380
 M[     0250   0660   1380   1460   2190   2270   2290   2330   2350   2430
        2480
 N1$    0230   0480   1040
 N2$    0230   0490   1050   1100
 R0     1400   1410   1420   1440
 R0$    0240   0290   1440
 R1$    0240   1430   1440   1460
 S      2250   2390
 S0     0630   1210   2170   2450   3050   3060   3090
 S1     0630   1210   2170   2450   2950   3000   3060   3090
 S2     1390   1400   1410   1420
 S[     0250   0650   1390   1400   1410   1460   2350   2420   2430   2470
 U      2240
 U1     0630   1180   2170   2450
 U2     0630   1180   2170   2450
 U3     0630   1180   2170   2450
 U[     0250   0640   1380   1460   2290   2350   2430   2460   2540   2570
        2580   2590   2980   3010
 W$     0240   1760   1780   1870
```

COLOR ANALYSIS GENERAL SUMMARY AND INTERMEDIATE CHECK STANDARDS/UNKNOWNS REPORT MODULE -- UVVO.L4

UVVO.L4 is chained to from either the automated or manual color analysis or color sample analysis modules (UVVO.L1, UVVO.LO, UVVO.L2, or UVVO.L3). Parameters are first retrieved from the system status transfer file. Then basic parameters are retrieved from the data summary file and the color analysis historical standards file (UVVOL.SF for the automated mode or UVVOL.SM for the manual mode). UVVO.L4 then moves to either the general summary report section or the intermediate report section, depending on whether the chained-from program is a main color analysis module (as UVVO.L1 and UVVO.LO) or a color sample analysis module (as UVVO.L2 and UVVO.L3).

The general summary report preparation begins with formatting of the front page heading. The standards equation and basic standards information follow. A segment each for check standards and unknowns is produced, if any samples of either type have been run. Should more than one page be needed, a less formal page heading is repeated, and a heading for the information segment. Because these extra heading portions concern only the lineprinter output, they are preceded and followed by records which contain simply an ampersand character.

In the intermediate check standards/unknowns report section, the sample-type flag is first examined. Based on this flag, either a check standards report or an unknowns report is prepared. A small title is first formatted, along with the date and names. The information segment is then readied, and is of the same form as in the general summary report, being prepared by the same subroutine.

When the report is complete, residing in the list file UVVLPT, options are offered for terminal output, lineprinter output, and continuance of the analysis. Terminal output segments ignore sections enclosed by ampersand-signed records, and also permit the output of no more than two blank lines in sequence. In lineprinter report generation, the module transfers all records from UVVLPT to the lineprinter device list file $LPT, except for the ampersand-signed records. To continue, control drops to the color module return point.

At the color module return point, the modified program location variables are written into the system status transfer file. The report module then chains back to the chained-from module.

Five report preparation subroutines are included in this module. Two prepare general summary report page headings. The first is for the front page heading, while the second is for any subsequent page headings. Each of the subroutines calls the date-and-names subroutine.

The date-and-names subroutine, when first called, fixes the report date and time, to a certain degree. This subroutine is used by not only the summary report heading subroutines, but also by the intermediate report section.

The last two subroutines generate information on check standards and unknowns. Each accommodates line counting and, thus, extra headings in the case of a general summary report. The check standards information subroutine also tags on an explanation of the control rating symbols it produces.

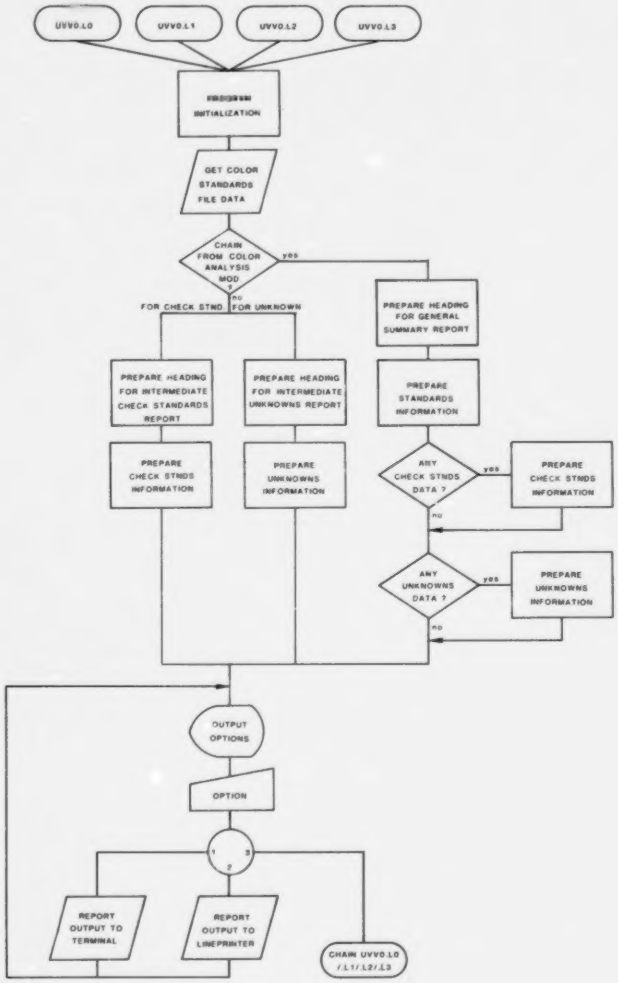

UVVO.L0
UVVO.L1
UVVO.L2
UVVO.L3
PROGRAM INITIALIZATION
GET COLOR STANDARDS FILE DATA
CHAIN FROM COLOR ANALYSIS MOD ?
yes
no
FOR CHECK STND
FOR UNKNOWN
PREPARE HEADING FOR GENERAL SUMMARY REPORT
PREPARE HEADING FOR INTERMEDIATE CHECK STANDARDS REPORT
PREPARE HEADING FOR INTERMEDIATE UNKNOWNS REPORT
PREPARE STANDARDS INFORMATION
PREPARE CHECK STNDS INFORMATION
PREPARE UNKNOWNS INFORMATION
ANY CHECK STNDS DATA ?
yes
PREPARE CHECK STNDS INFORMATION
no
ANY UNKNOWNS DATA ?
yes
PREPARE UNKNOWNS INFORMATION
no
OUTPUT OPTIONS
OPTION
1
2
3
REPORT OUTPUT TO TERMINAL
REPORT OUTPUT TO LINEPRINTER
CHAIN UVVO.L0 /.L1/.L2/.L3

Figure 18. Flowchart of module UVVO.L4.

TABLE 25. VARIABLE DESCRIPTIONS FOR MODULE UVVO.L4

A	the computed ADMI
A$	a single-character user-response variable
AO	the expected ADMI of a check standard
A1()	the ADMI values of the six APHA standards
B$	a character string composed of blanks
C$	the comment for an unknown
D	the measured DE number
D$	a date character string
DO$	a portion of the date character string
D1, D2, D3	report date and time variables
E	the absolute value difference between mean standard and measured DE numbers
FO$	a file name variable
F1$, F2$, F3$	program location variables; see Table 1
F5	a flag used during program initialization; also used by all subroutines, where initially set to zero, is returned as: F5 = 0 for escape during subroutine F5 = 1 for completed subroutine function
F6*	a flag used by the check standards and unknowns information heading sub-subroutines, where initially set to zero, is returned as: F6 = 0 for escape during subroutine F6 = 1 for completed subroutine function
I, IO*	loop-counter and general-purpose variables
I$	the identifier of a check standard or unknown
JO	a pointer for data summary file records
KO	a loop-counter and general-purpose variable
L	the line counter
L$	an output and output-format character string
LO	the limit of report lines per page
M	the sample-type flag; see variable MO in Table 23
MO	the sample-type flag-related routing flag
M1, M2, M3	the date of the most recent standards update
M()	color standards data
NO	the number of sets of color standards
N1, N2	the number of check standards and unknowns, respectively
N1$, N2$	the analyst's and instrument's names
P	the page counter
PO	the pointer to the oldest set of update standards in UVVOL.SF or UVVOL.SM

TABLE 25 (continued)

R0	a control rating indicator for check standards
R0$, R1$	output character strings used for control ratings
S2, S3	two and three times the standard deviation of a standard mean DE
S()	the standard deviations of the standards mean DEs
U1, U2, U3	the constants of the standards curve
U()	the mean DE's of the six APHA standards
W$	a control character in each output list file record

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                         PAGE  1
                  PROGRAM LISTING FOR UVV0.L4

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0010 REM            +++++++++++++++++++++++++++++++++++++
0020 REM            +   AUTOMATED  ULTRAVIOLET-VISIBLE  +
0030 REM            +      SPECTROPHOTOMETER SYSTEM     +
0040 REM            +   COLOR ANALYSIS GENERAL SUMMARY  +
0050 REM            +   AND INTERMEDIATE CHECK STNDS /  +
0060 REM            +   UNKNOWNS REPORT MOD.:  UVV0.L4  +
0070 REM            +   WRITTEN BY GREG ROTH (6/10/80)  +
0080 REM            +   UNIV. OF CINCI. COMPUTER CENTER +
0090 REM            +   (UVV0.L4 IS A SUB-MODULE OF THE +
0100 REM            +   COLOR ANALYSIS MODULES UVV0.L0, +
0110 REM            +   UVV0.L1, UVV0.L3, AND UVV0.L6)  +
0120 REM            +++++++++++++++++++++++++++++++++++++
0130 REM
0140 REM
0150 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0160 REM                      PROGRAM INITIALIZATION
0170 REM
0180 REM ----------  SET PAGE/ESC/ROUTE-FLAG
0190 PAGE =72
0200 ON ESC THEN GOTO 0430
0210 LET F5=0
0220 ESC
0230 REM ----------  DIM/INIT STRING VAR'S AND ARRAYS
0240 DIM F0$[13],F1$[13],F2$[13],F3$[13],N1$[20],N2$[20]
0250 DIM L$[72],W$[1],B$[32],D$[32],D0$[4]
0260 DIM A$[1],C$[30],I$[8],R0$[3],R1$[3]
0270 DIM A1[6],U[6],S[6],R[6],M[6]
0280 LET R0$="***"
0290 FOR I=1 TO 32
0300   LET B$[I,I]=" "
0310 NEXT I
0320 LET A1[1]=25
0330 LET A1[2]=50
0340 LET A1[3]=100
0350 LET A1[4]=150
0360 LET A1[5]=200
0370 LET A1[6]=250
0380 LET L0=62
0390 LET L=0
0400 LET P=1
0410 GOTO 0480
0420 REM ----------  ESCAPE DURING PROGRAM INITIALIZATION

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                         PAGE  2
                  PROGRAM LISTING FOR UVV0.L4

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0430 NOESC
0440 CLOSE
0450 DIM F0$[13],F1$[13],F2$[13],F3$[13]
0460 LET F5=1
0470 REM ----------  RETRIEVE SYSTEM STATUS PARM'S
0480 LET F0$="UVV00.TR"
0490 OPEN FILE[0,0],F0$,21
0500 READ FILE[0,1],F1$
0510 READ FILE[0,2],F2$
0520 READ FILE[0,3],F3$
0530 READ FILE[0,4],N1$
0540 READ FILE[0,5],N2$
0550 CLOSE FILE[0]
0560 REM   [MODIFY PROGRAM LOCATION VAR'S]
0570 LET F1$=F2$
0580 LET F2$=F3$
0590 LET F3$=F1$
0600 IF F5=1 THEN GOTO 2220
0610 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0620 REM                          PREPARE REPORT
0630 REM
0640 ON ESC THEN GOTO 2220
0650 REM ----------  OPEN FILES & RETRIEVE INITIAL DATA
0660 LET F0$="UVV0L.DS"
0670 OPEN FILE[4,0],F0$,21
0680 READ FILE[4,0],M0,N1,N2
0690 LET F0$="UVV0L.SF"
0700 IF F1$="UVV0.L0" THEN LET F0$="UVV0L.SM"
0710 IF F1$="UVV0.L3" THEN LET F0$="UVV0L.SM"
0720 OPEN FILE[3,0],F0$,36
0730 READ FILE[3,0],N0,P0,U1,U2,U3
0740 READ FILE[3,1],U[1],U[2],U[3],U[4],U[5],U[6]
0750 READ FILE[3,2],S[1],S[2],S[3],S[4],S[5],S[6]
0760 READ FILE[3,3],R[1],R[2],R[3],R[4],R[5],R[6]
0770 LET I0=N0-1+P0
0780 LET I0=I0-INT((I0-1)/6)*6
0790 READ FILE[3,I0+3],M[1],M[2],M[3],M[4],M[5],M[6],M1,M2,M3
0800 LET F0$="UVVLPT"
0810 OPEN FILE[7,1],F0$
0820 IF F1$="UVV0.L1" THEN LET M0=1
0830 IF F1$="UVV0.L0" THEN LET M0=1
0840 IF M0>1 THEN GOTO 1470

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE  3
                      PROGRAM LISTING FOR UVV0.L4

123456789112345678921234567893123456789412345678951234567896123456789 7
         0         0         0         0         0         0         0
0850 REM ----------  GENERAL SUMMARY REPORT
0860 LET F5=0
0870 GOSUB 2350
0880 ON ESC THEN GOTO 2220
0890 IF F5=0 THEN GOTO 2220
0900 REM   [STANDARDS]
0910 LET L$=B$[1,10],"ADMI = -#.###^^^^ # (-#.###^^^^ "
0920 LET L$=L$,"* DE) # (-#.###^^^^ * DE^2)"
0930 PRINT FILE[7]
0940 PRINT FILE[7],"STANDARDS INFORMATION:"
0950 PRINT FILE[7],"     CALIBRATION EQUATION ---"
0960 PRINT FILE[7],USING L$,U1,"+",U2,"+",U3
0970 LET L$=B$[1,9],"[STANDARD ERROR OF ESTIMATE(SEE): "
0980 LET L$=L$,"---#.###   %REL SEE:--#.##]"
0990 PRINT FILE[7],USING L$,S0,S1
1000 LET L$="     MOST RECENT STANDARDS UPDATE: ",STR$(M1),"/"
1010 LET L$=L$,STR$(M2),"/",STR$(M3-INT(M3/100)*100)
1020 PRINT FILE[7],L$
1030 LET L$="ADMI OF      MEAN DE       STANDARD     % RELATIVE"
1040 PRINT FILE[7]
1050 PRINT FILE[7],L$
1060 LET L$="  APHA        OF ALL     DEVIATION OF   STND. DEV."
1070 PRINT FILE[7],L$
1080 LET L$="STANDARD    STANDARDS      MEAN DE      OF MEAN DE"
1090 PRINT FILE[7],L$
1100 LET L$="--------    ----------   ------------   ----------"
1110 PRINT FILE[7],L$
1120 LET L$="   ##        -#.####       -#.####       ---#.###"
1130 FOR I0=1 TO 6
1140   IF A1[I0]>=100 THEN LET L$[3,3]="#"
1150   PRINT FILE[7],USING L$,A1[I0],U[I0],S[I0],R[I0]
1160 NEXT I0
1170 LET L=L+17
1180 IF N1=0 THEN GOTO 1270
1190 REM   [CHECK STANDARDS]
1200 PRINT FILE[7]
1210 PRINT FILE[7],"CHECK STANDARDS INFORMATION:"
1220 LET L=L+2
1230 LET F5=0
1240 GOSUB 3000
1250 ON ESC THEN GOTO 2220
1260 IF F5=0 THEN GOTO 2220

123456789112345678921234567893123456789412345678951234567896123456789 7
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE  4
                      PROGRAM LISTING FOR UVV0.L4

123456789112345678921234567893123456789412345678951234567896123456789 7
         0         0         0         0         0         0         0
1270 IF N2=0 THEN CLOSE
1280 IF N2=0 THEN GOTO 1680
1290 REM   [UNKNOWNS]
1300 LET I=2
1310 IF N2=1 THEN LET I=1
1320 IF (L+6+I)<=L0 THEN GOTO 1370
1330 LET F5=0
1340 GOSUB 2560
1350 ON ESC THEN GOTO 2220
1360 IF F5=0 THEN GOTO 2220
1370 PRINT FILE[7]
1380 PRINT FILE[7],"UNKNOWNS INFORMATION:"
1390 LET L=L+2
1400 LET F5=0
1410 GOSUB 3720
1420 ON ESC THEN GOTO 2220
1430 IF F5=0 THEN GOTO 2220
1440 CLOSE
1450 GOTO 1680
1460 REM ----------  INTERMEDIATE CHECK STANDARDS / UNKNOWNS REPORT
1470 LET L$="<<<<<<<<<<<<<<<<<<<<<<   UVVIS  COLOR  "
1480 LET L$=L$,"ANALYSIS   >>>>>>>>>>>>>>>>>>>>>>>"
1490 PRINT FILE[7]
1500 PRINT FILE[7]
1510 PRINT FILE[7],L$
1520 IF M0=2 THEN LET L$[24,47]="CHECK  STANDARDS  REPORT"
1530 IF M0=3 THEN LET L$[24,47]="SAMPLE  UNKNOWNS  REPORT"
1540 PRINT FILE[7],L$
1550 LET L=L+4
1560 LET F5=0
1570 GOSUB 2730
1580 ON ESC THEN GOTO 2220
1590 IF F5=0 THEN GOTO 2220
1600 LET F5=0
1610 ON (M0-1) THEN GOSUB 3000, 3720
1620 ON ESC THEN GOTO 2220
1630 IF F5=0 THEN GOTO 2220
1640 CLOSE
1650 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
1660 REM                        REPORT OUTPUT
1670 REM
1680 ON ESC THEN GOTO 2220

123456789112345678921234567893123456789412345678951234567896123456789 7
         0         0         0         0         0         0         0
```

```
123456789112345678921234567893123456789412345678951234567896123456789
        0          0          0          0          0          0        0
1690 ESC
1700 ON ERR THEN GOTO 1770
1710 PRINT
1720 PRINT "REPORT OUTPUT:  TERMINAL[1], LINEPRINTER[2], ";
1730 INPUT "OR CONTINUE[3(CR)]  >>> ",A$
1740 ON ERR THEN STOP
1750 IF LEN(A$)=0 THEN LET A$="3"
1760 ON POS("123",A$,1) THEN GOTO 1820, 1990, 2220
1770 ON ERR THEN STOP
1780 PRINT "<7>"
1790 PRINT "PLEASE ENTER 1, 2, OR 3."
1800 GOTO 1700
1810 REM ----------  TERMINAL REPORT
1820 ON ESC THEN GOTO 2160
1830 LET I=0
1840 OPEN FILE[7,3],"UVVLPT"
1850 LREAD FILE[7],L$,W$
1860 IF EOF(7)=1 THEN GOTO 2160
1870 IF LEN(L$)>0 THEN LET I=0
1880 LET I=I+1
1890 IF I>2 THEN GOTO 1850
1900 IF L$="&" THEN GOTO 1950
1910 LET L$=L$,W$
1920 PRINT L$;
1930 GOTO 1850
1940 REM   [IGNORE LINEPRINTER-SPECIFIC MATERIAL]
1950 LREAD FILE[7],L$,W$
1960 IF L$<>"&" THEN GOTO 1950
1970 GOTO 1850
1980 REM ----------  LINEPRINTER REPORT
1990 ON ESC THEN GOTO 2160
2000 OPEN FILE[7,3],"UVVLPT"
2010 ON ERR THEN GOTO 2110
2020 OPEN FILE[1,1],"$LPT"
2030 ON ERR THEN STOP
2040 LREAD FILE[7],L$,W$
2050 IF EOF(7)=1 THEN GOTO 2160
2060 IF L$="&" THEN GOTO 2040
2070 LET L$=L$,W$
2080 PRINT FILE[1],B$[1,4];L$
2090 GOTO 2040
2100 REM   [LINEPRINTER IN USE]

123456789112345678921234567893123456789412345678951234567896123456789
        0          0          0          0          0          0        0
```

```
123456789112345678921234567893123456789412345678951234567896123456789
        0          0          0          0          0          0        0
2110 PRINT "<7>"
2120 PRINT "LINEPRINTER IN USE: WILL WAIT 10 SECS. & RETRY."
2130 DELAY =9
2140 GOTO 2010
2150 REM ----------  END OF / ESCAPE DURING REPORT OUTPUT
2160 NOESC
2170 CLOSE
2180 GOTO 1680
2190 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
2200 REM                COLOR MODULE RETURN POINT
2210 REM
2220 NOESC
2230 CLOSE
2240 LET F0$="UVV00.TR"
2250 OPEN FILE[0,0],F0$,21
2260 WRITE FILE[0,1],F1$
2270 WRITE FILE[0,2],F2$
2280 WRITE FILE[0,3],F3$
2290 CLOSE FILE[0]
2300 CHAIN F3$
2310 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
2320 REM              OUTPUT PREPARATION SUBROUTINES
2330 REM
2340 REM ----------  PRIMARY SUMMARY PAGE HEADING SUBRT.
2350 ON ESC THEN RETURN
2360 LET L$=B$[1,21],"******************************"
2370 PRINT FILE[7]
2380 PRINT FILE[7]
2390 PRINT FILE[7],L$
2400 LET L$=B$[1,21],"*",B$[1,28],"*"
2410 PRINT FILE[7],L$
2420 LET L$=B$[1,21],"*           UVVIS            *"
2430 PRINT FILE[7],L$
2440 LET L$=B$[1,21],"*",B$[1,28],"*"
2450 PRINT FILE[7],L$
2460 LET L$=B$[1,21],"*  COLOR  ANALYSIS  SUMMARY  *"
2470 PRINT FILE[7],L$
2480 LET L$=B$[1,21],"*",B$[1,28],"*"
2490 PRINT FILE[7],L$
2500 LET L$=B$[1,21],"******************************"
2510 PRINT FILE[7],L$
2520 LET L=L+9

123456789112345678921234567893123456789412345678951234567896123456789
        0          0          0          0          0          0        0
```

PROGRAM LISTING FOR UVV0.L4

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2530 GOSUB 2730
2540 RETURN
2550 REM ----------  SECONDARY SUMMARY PAGE HEADING SUBRT.
2560 ON ESC THEN RETURN
2570 FOR I=(L+1) TO 66
2580   PRINT FILE[7]
2590 NEXT I
2600 LET P=P+1
2610 LET L=0
2620 LET L$=B$,B$,"PAGE #"
2630 PRINT FILE[7],USING L$,P
2640 LET L$=B$[1,30],"UVVIS COLOR"
2650 PRINT FILE[7]
2660 PRINT FILE[7],L$
2670 LET L$=B$[1,28],"ANALYSIS SUMMARY"
2680 PRINT FILE[7],L$
2690 LET L=L+4
2700 GOSUB 2730
2710 RETURN
2720 REM ----------  DATE-AND-NAMES SUBRT.
2730 ON ESC THEN RETURN
2740 IF P>1 THEN GOTO 2870
2750 LET D3=SYS(12)
2760 LET D2=SYS(11)
2770 LET D1=SYS(3)
2780 LET D1=D1-INT(D1/100)*100
2790 LET D0$="A.M."
2800 IF D2>=12 THEN LET D0$[1,1]="P"
2810 LET D2=D2-INT((D2-1)/12)*12
2820 LET D$="DATE/TIME:  ",STR$(SYS(2)),"/"
2830 LET D$=D$,STR$(SYS(1)),"/",STR$(D1)
2840 LET D$=D$,"  ",STR$(D2),":"
2850 IF D3<10 THEN LET D$=D$,"0"
2860 LET D$=D$,STR$(D3)," ",D0$
2870 LET L$=B$[1,INT((71-LEN(D$))/2)],D$
2880 PRINT FILE[7]
2890 PRINT FILE[7],L$
2900 LET L$="ANALYST: ",N1$
2910 IF (50-(LEN(N1$)+LEN(N2$)))>32 THEN LET L$=L$,B$
2920 LET L$=L$,B$[1,59-(LEN(N2$)+LEN(L$))]
2930 LET L$=L$,"INSTRUMENT: ",N2$
2940 PRINT FILE[7]

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

PROGRAM LISTING FOR UVV0.L4

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
2950 PRINT FILE[7],L$
2960 LET L=L+4
2970 LET F5=1
2980 RETURN
2990 REM ----------  CHECK STANDARDS INFORMATION SUBRT.
3000 ON ESC THEN RETURN
3010 LET F6=0
3020 GOSUB 3520
3030 ON ESC THEN RETURN
3040 IF F6=0 THEN RETURN
3050 LET J0=1
3060 FOR I0=1 TO N1
3070   READ FILE[4,J0],M,I$,A0,D
3080   LET J0=J0+1+(M-2)*D
3090   IF M<>2 THEN GOTO 3070
3100   FOR K0=1 TO 6
3110     IF A1[K0]=A0 THEN GOTO 3130
3120   NEXT K0
3130   LET E=ABS(U[K0]-D)
3140   LET S2=S[K0]+S[K0]
3150   LET S3=S2+S[K0]
3160   IF E>S3 THEN LET R0=3
3170   IF E>=S2 THEN IF E<=S3 THEN LET R0=2
3180   IF E<S2 THEN LET R0=1
3190   LET R1$=B$[1,3]
3200   LET R1$[1,R0]=R0$[1,R0]
3210   LET A=U1+D*(U2+D*U3)
3220   PRINT FILE[7],USING L$,I$,A0,D,A,U[K0],S[K0],(D-U[K0]),R0$[1,R0
*      ]
3230   LET L=L+1
3240   IF M0>1 THEN GOTO 3370
3250   IF L<>(L0-6) THEN GOTO 3370
3260   IF (N1-I0+4)<=2 THEN GOTO 3370
3270   PRINT FILE[7],"&"
3280   GOSUB 2560
3290   ON ESC THEN RETURN
3300   IF F5=0 THEN RETURN
3310   LET F5=0
3320   LET F6=0
3330   GOSUB 3520
3340   ON ESC THEN RETURN
3350   IF F6=0 THEN RETURN

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
3360   PRINT FILE[7],"&"
3370 NEXT I0
3380 LET L$="NOTE: CONTROL RATINGS BASED ON ABSOLUTE "
3390 LET L$=L$,"VALUE(D') OF DE DIFF(D) RELA-"
3400 PRINT FILE[7]
3410 PRINT FILE[7],L$
3420 LET L$="TIVE TO STND DEV(C) OF STANDARDS MEAN DE, "
3430 LET L$=L$,"SUCH THAT:  * --- IN CONTROL"
3440 PRINT FILE[7],L$
3450 LET L$="[D'<2C];  ** --- WARNING [2C<=D'<=3C];  "
3460 LET L$=L$,"*** --- OUT OF CONTROL [D'>3C]."
3470 PRINT FILE[7],L$
3480 LET L=L+4
3490 LET F5=1
3500 RETURN
3510 REM   [CHECK STNDS INFO. HDG. SUB-SUBRT.]
3520 ON ESC THEN RETURN
3530 LET L$="  CHECK    APHA   MEAS'D   MEAS'D   "
3540 LET L$=L$,"STAND'S   ST. DV.   DIFF.   CONTROL"
3550 PRINT FILE[7]
3560 PRINT FILE[7],L$
3570 LET L$="STANDARD   STND     DE      ADMI    "
3580 LET L$=L$,"MEAN DE   OF MEAN   [A-B]   RATING"
3590 PRINT FILE[7],L$
3600 LET L$="   ID      ADMI     [A]    (CALC)     "
3610 LET L$=L$,"[B]     DE [C]     [D]    (NOTE)"
3620 PRINT FILE[7],L$
3630 LET L$="--------   ----  -------   -------  "
3640 LET L$=L$,"-------   -------  -------  -------"
3650 PRINT FILE[7],L$
3660 LET L=L+6
3670 LET L$="########   ###   -#.####  ---#.###  "
3680 LET L$=L$,"#.####   -#.####  -#.####    ###"
3690 LET F6=1
3700 RETURN
3710 REM ----------  UNKNOWNS INFORMATION SUBRT.
3720 ON ESC THEN RETURN
3730 LET F6=0
3740 GOSUB 4060
3750 ON ESC THEN RETURN
3760 IF F6=0 THEN RETURN
3770 LET J0=0

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
3780 FOR I0=1 TO N2
3790   LET J0=J0+1
3800   READ FILE[4,J0],M,I$,D,K0
3810   IF M<>3 THEN GOTO 3790
3820   LET C$=""
3830   IF K0>=1 THEN READ FILE[4,J0+1],C$
3840   IF K0=2 THEN READ FILE[4,J0+2],C$[LEN(C$)+1]
3850   LET A=U1+D*(U2+D*U3)
3860   PRINT FILE[7],USING L$,I$,D,A,C$
3870   LET L=L+1
3880   IF M0>1 THEN GOTO 4010
3890   IF L<L0 THEN GOTO 4010
3900   IF I0=N2 THEN GOTO 4010
3910   PRINT FILE[7],"&"
3920   GOSUB 2560
3930   ON ESC THEN RETURN
3940   IF F5=0 THEN RETURN
3950   LET F5=0
3960   LET F6=0
3970   GOSUB 4060
3980   ON ESC THEN RETURN
3990   IF F6=0 THEN RETURN
4000   PRINT FILE[7],"&"
4010   LET J0=J0+K0
4020 NEXT I0
4030 LET F5=1
4040 RETURN
4050 REM   [UNKNOWNS INFO. HDG. SUB-SUBRT.]
4060 ON ESC THEN RETURN
4070 LET L$=" SAMPLE    MEASURED    CALCULATED"
4080 LET L$=L$,B$[1,14],"SAMPLE"
4090 PRINT FILE[7]
4100 PRINT FILE[7],L$
4110 LET L$="   ID      DE NUMBER   ADMI VALUE"
4120 LET L$=L$,B$[1,14],"COMMENT"
4130 PRINT FILE[7],L$
4140 LET L$="--------   ---------   ----------   "
4150 LET L$=L$,"-------------------------------"
4160 PRINT FILE[7],L$
4170 LET L=L+4
4180 LET L$="########    -#.####    ----#.###    "
4190 LET L$=L$,"###############################"

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                              PAGE 11
                 PROGRAM LISTING FOR UVVO.L4

12345678911234567892123456789312345678941234567895123456789612345678907
         0         0         0         0         0         0         0
4200 LET F6=1
4210 RETURN

























12345678911234567892123456789312345678941234567895123456789612345678907
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/2/1980                                              PAGE 12
                 SYMBOL TABLE FOR UVVO.L4

SYMBOL   REFERENCES
------   ----------------------------------------------------------------
0430     0200
0480     0410
1270     1180
1370     1320
1470     0840
1680     1280  1450  2180
1700     1800
1770     1700
1820     1760
1850     1890  1930  1970
1950     1900  1960
1990     1760
2010     2140
2040     2060  2090
2110     2010
2160     1820  1860  1990  2050
2220     0600  0640  0880  0890  1250  1260  1350  1360  1420  1430
         1580  1590  1620  1630  1680  1760
2350     0870
2560     1340  3280  3920
2730     1570  2530  2700
2870     2740
3000     1240  1610
3070     3090
3130     3110
3370     3240  3250  3260
3520     3020  3330
3720     1410  1610
3790     3810
4010     3880  3890  3900
4060     3740  3970
A        3210  3220  3850  3860
A$       0260  1730  1750  1760
A0       3070  3110  3220
A1[      0270  0320  0330  0340  0350  0360  0370  1140  1150  3110
B$       0250  0300  0910  0970  2080  2360  2400  2420  2440  2460
         2480  2500  2620  2640  2670  2870  2910  2920  3190  4080
         4120
C$       0260  3820  3830  3840  3860
D        3070  3080  3130  3210  3220  3800  3850  3860
D$       0250  2820  2830  2840  2850  2860  2870
D0$      0250  2790  2800  2860
D1       2770  2780  2830
D2       2760  2800  2810  2840
D3       2750  2850  2860
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE 13
                        SYMBOL TABLE FOR UVV0.L4

SYMBOL    REFERENCES
------    ----------------------------------------------------------------
 E       3130  3160  3170  3180
 F0$     0240  0450  0480  0490  0660  0670  0690  0700  0710  0720
         0800  0810  2240  2250
 F1$     0240  0450  0500  0570  0590  0700  0710  0820  0830  2260
 F2$     0240  0450  0510  0570  0580  2270
 F3$     0240  0450  0520  0580  0590  2280  2300
 F5      0210  0460  0600  0860  0890  1230  1260  1330  1360  1400
         1430  1560  1590  1600  1630  2970  3300  3310  3490  3940
         3950  4030
 F6      3010  3040  3320  3350  3690  3730  3760  3960  3990  4200
 FL#0    0490  0500  0510  0520  0530  0540  0550  2250  2260  2270
         2280  2290
 FL#1    2020  2080
 FL#3    0720  0730  0740  0750  0760  0790
 FL#4    0670  0680  3070  3800
 FL#7    0810  0930  0940  0950  0960  0990  1020  1040  1050  1070
         1090  1110  1150  1200  1210  1370  1380  1490  1500  1510
         1540  1840  1850  1950  2000  2040  2370  2380  2390  2410
         2430  2450  2470  2490  2510  2580  2630  2650  2660  2680
         2880  2890  2940  2950  3220  3270  3360  3400  3410  3440
         3470  3550  3560  3590  3620  3650  3860  3910  4000  4090
         4100  4130  4160
 I       0290  0300  0310  1300  1310  1320  1830  1870  1880  1890
         2570  2590
 I$      0260  3070  3220  3800  3860
 I0      0770  0780  0790  1130  1140  1150  1160  3060  3260  3370
         3780  3900  4020
 J0      3050  3070  3080  3770  3790  3800  3830  3840  4010
 K0      3100  3110  3120  3130  3140  3150  3220  3800  3830  3840
         4010
 L       0390  1170  1220  1320  1390  1550  2520  2570  2610  2690
         2960  3230  3250  3480  3660  3870  3890  4170
 L$      0250  0910  0920  0960  0970  0980  0990  1000  1010  1020
         1030  1050  1060  1070  1080  1090  1100  1110  1120  1140
         1150  1470  1480  1510  1520  1530  1540  1850  1870  1900
         1910  1920  1950  1960  2040  2060  2070  2080  2360  2390
         2400  2410  2420  2430  2440  2450  2460  2470  2480  2490
         2500  2510  2620  2630  2640  2660  2670  2680  2870  2890
         2900  2910  2920  2930  2950  3220  3380  3390  3410  3420
         3430  3440  3450  3460  3470  3530  3540  3560  3570  3580
         3590  3600  3610  3620  3630  3640  3650  3670  3680  3860
         4070  4080  4100  4110  4120  4130  4140  4150  4160  4180
         4190
 L0      0380  1320  3250  3890
 M       3070  3080  3090  3800  3810
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/2/1980                                                          PAGE 14
                        SYMBOL TABLE FOR UVV0.L4

SYMBOL    REFERENCES
------    ----------------------------------------------------------------
 M0      0680  0820  0830  0840  1520  1530  1610  3240  3880
 M1      0790  1000
 M2      0790  1010
 M3      0790  1010
 M[      0270  0790
 N0      0730  0770
 N1      0680  1180  3060  3260
 N1$     0240  0530  2900  2910  2920
 N2      0680  1270  1280  1310  3780  3900
 N2$     0240  0540  2910  2930
 P       0400  2600  2630  2740
 P0      0730  0770
 R0      3160  3170  3180  3200  3220
 R0$     0260  0280  3200  3220
 R1$     0260  3190  3200
 R[      0270  0760  1150
 S0      0990
 S1      0990
 S2      3140  3150  3170  3180
 S3      3150  3160  3170
 S[      0270  0750  1150  3140  3150  3220
 U1      0730  0960  3210  3850
 U2      0730  0960  3210  3850
 U3      0730  0960  3210  3850
 U[      0270  0740  1150  3130  3220
 W$      0250  1850  1910  1950  2040  2070
```

COLOR ANALYSIS SUMMARY STANDARDS REPORT MODULE -- UVVO.L5

UVVO.L5 is chained to from either UVVO.L1 or UVVO.L0. It retrieves parameters from the system status transfer file, and from the color analysis historical standards file. The latter file is UVVOL.SF in the automated mode, while UVVOL.SM in the manual mode.

The date and time of the report is established. The report title, date, and names are first formatted. Next follows the standards equation and the standard errors of estimate. The six DE's of each set of standards are prepared, along with the date of each. Finally, means, standard deviations, and percent relative standard deviations are formatted.

With the report readied in the list file UVVLPT, options are presented for terminal and lineprinter output, and for continuance of the color run. For lineprinter output, the records of UVVLPT are transferred to $LPT, the list file associated with the lineprinter device. To continue, module control drops to the color analysis module return point, where, after the modified program location variables have been written into the system status transfer file, a chain is made to the chained-from module.

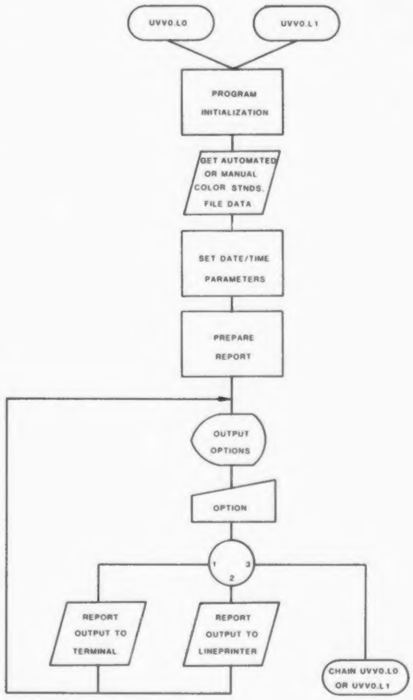

UVV0.L0
UVV0.L1
PROGRAM INITIALIZATION
GET AUTOMATED OR MANUAL COLOR STNDS. FILE DATA
SET DATE/TIME PARAMETERS
PREPARE REPORT
OUTPUT OPTIONS
OPTION
1
2
3
REPORT OUTPUT TO TERMINAL
REPORT OUTPUT TO LINEPRINTER
CHAIN UVV0.L0 OR UVV0.L1

Figure 19. Flowchart of module UVV0.L5.

TABLE 26. VARIABLE DESCRIPTIONS FOR MODULE UVVO.L5

A$	a single-character user-response variable
A1()	the ADMI values of the six APHA standards
B$	a character string composed of blanks
D$	a date character string
D1, D2, D3	report date and time variables
F0$	a file name variable
F1$, F2$, F3$	program location variables; see Table 1
F5	a flag used during program initialization
I	a loop-counter and general-purpose variable
L$	an output and output-format character string
M()	a matrix containing DE numbers and dates for all sets of standards
N	the number of sets of update standards
N1$, N2$	the analyst's and instrument's names
P	the pointer to the oldest set of standards in UVVOL.SF or UVVOL.SM
R()	the percent relative standard deviations of the standards mean DEs
S0, S1	the actual and percent relative standard errors of estimate
S()	the standard deviations of the standards mean DE's
U1, U2, U3	the constants of the standards curve
U()	the mean DEs of the six APHA standards
V$	a general-purpose character string
W$	a control character in each output list file record

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/3/1980                                                          PAGE  1
                   PROGRAM LISTING FOR UVV0.L5

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0010 REM         +++++++++++++++++++++++++++++++++++++
0020 REM         +    AUTOMATED  ULTRAVIOLET-VISIBLE    +
0030 REM         +      SPECTROPHOTOMETER SYSTEM        +
0040 REM         +     COLOR ANALYSIS SUMMARY STAN-     +
0050 REM         +     DARDS REPORT MODULE: UVV0.L5     +
0060 REM         +    WRITTEN BY GREG ROTH (6/12/80)    +
0070 REM         +    UNIV. OF CINCI. COMPUTER CENTER   +
0080 REM         +    (UVV0.L5 IS SUB-MODULE OF COLOR   +
0090 REM         +    ANALYSIS MOD'S UVV0.L0, UVV0.L1)  +
0100 REM         +++++++++++++++++++++++++++++++++++++
0110 REM
0120 REM
0130 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0140 REM                 PROGRAM INITIALIZATION
0150 REM
0160 REM ----------  SET PAGE/ESC/ROUTE-FLAG
0170 PAGE =72
0180 ON ESC THEN GOTO 0360
0190 LET F5=0
0200 ESC
0210 REM ----------  DIM/INIT STRING VAR'S AND ARRAYS
0220 DIM F0$[13],F1$[13],F2$[13],F3$[13],N1$[20],N2$[20]
0230 DIM L$[72],W$[1],B$[32],D$[32],A$[1],V$[20]
0240 DIM A1[6],U[6],S[6],M[6,9],R[6]
0250 FOR I=1 TO 32
0260   LET B$[I,I]=" "
0270 NEXT I
0280 LET A1[1]=25
0290 LET A1[2]=50
0300 LET A1[3]=100
0310 LET A1[4]=150
0320 LET A1[5]=200
0330 LET A1[6]=250
0340 GOTO 0410
0350 REM ----------  ESCAPE DURING PROGRAM INITIALIZATION
0360 NOESC
0370 CLOSE
0380 DIM F0$[13],F1$[13],F2$[13],F3$[13]
0390 LET F5=1
0400 REM ----------  RETRIEVE SYSTEM STATUS PARM'S
0410 LET F0$="UVV00.TR"
0420 OPEN FILE[0,0],F0$,21

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/3/1980                                                          PAGE  2
                   PROGRAM LISTING FOR UVV0.L5

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0430 READ FILE[0,1],F1$
0440 READ FILE[0,2],F2$
0450 READ FILE[0,3],F3$
0460 READ FILE[0,4],N1$
0470 READ FILE[0,5],N2$
0480 CLOSE FILE[0]
0490 REM   [MODIFY PROGRAM LOCATION VAR'S]
0500 LET F1$=F2$
0510 LET F2$=F3$
0520 LET F3$=F1$
0530 IF F5=1 THEN GOTO 2000
0540 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0550 REM                    PREPARE REPORT
0560 REM
0570 ON ESC THEN GOTO 2000
0580 REM ----------  RETRIEVE COLOR STANDARDS DATA
0590 IF F1$="UVV0.L1" THEN LET F0$="UVV0L.SF"
0600 IF F1$="UVV0.L0" THEN LET F0$="UVV0L.SM"
0610 OPEN FILE[3,0],F0$,36
0620 READ FILE[3,0],N,P,U1,U2,U3,S0,S1
0630 READ FILE[3,1],U[1],U[2],U[3],U[4],U[5],U[6]
0640 READ FILE[3,2],S[1],S[2],S[3],S[4],S[5],S[6]
0650 READ FILE[3,3],R[1],R[2],R[3],R[4],R[5],R[6]
0660 FOR I=1 TO N
0670   READ FILE[3,P+3],M[I,1],M[I,2],M[I,3],M[I,4],M[I,5],M[I,6],M[I,
*      7],M[I,8],M[I,9]
0680   LET P=P+1-INT(P/6)*6
0690 NEXT I
0700 CLOSE FILE[3]
0710 REM ----------  SET DATE/TIME PARM'S
0720 LET D3=SYS(12)
0730 LET D2=SYS(11)
0740 LET D1=SYS(3)
0750 LET D1=D1-INT(D1/100)*100
0760 LET V$=" A.M."
0770 IF D2>=12 THEN LET V$[2,2]="P"
0780 LET D2=D2-INT((D2-1)/12)*12
0790 LET D$="DATE/TIME:  ",STR$(SYS(2)),"/"
0800 LET D$=D$,STR$(SYS(1)),"/",STR$(D1)
0810 LET D$=D$,"  ",STR$(D2),":"
0820 IF D3<10 THEN LET D$=D$,"0"
0830 LET D$=D$,STR$(D3),V$

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/3/1980                                                  PAGE  3
                     PROGRAM LISTING FOR UVV0.L5

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
0840 REM ----------  PREPARE TEXT
0850 LET F0$="UVVLPT"
0860 OPEN FILE[7,1],F0$
0870 REM   [HEADINGS]
0880 LET L$="<<<<<<<<<<<<<<<<<<<<<<   UVVIS  COLOR  "
0890 LET L$=L$,"ANALYSIS    >>>>>>>>>>>>>>>>>>>>>>"
0900 PRINT FILE[7]
0910 PRINT FILE[7]
0920 PRINT FILE[7],L$
0930 LET L$[23,48]="SUMMARY  STANDARDS  REPORT"
0940 PRINT FILE[7],L$
0950 LET L$=B$[1,INT((71-LEN(D$))/2)],D$
0960 PRINT FILE[7]
0970 PRINT FILE[7],L$
0980 LET L$="ANALYST: ',N1$
0990 IF (49-(LEN(N1$)+LEN(N2$)))>32 THEN LET L$=L$,B$
1000 LET L$=L$,B$[1,58-(LEN(L$)+LEN(N2$))]
1010 LET L$=L$,"INSTRUMENT: ",N2$
1020 PRINT FILE[7]
1030 PRINT FILE[7],L$
1040 REM   [STANDARDS EQUATION]
1050 LET L$=B$[1,10],"ADMI = -#.###^^^^ # "
1060 LET L$=L$,"(-#.###^^^^ * DE) # (-#.###^^^^ * DE^2)"
1070 PRINT FILE[7]
1080 PRINT FILE[7],"STANDARDS CALIBRATION EQUATION ---"
1090 PRINT FILE[7],USING L$,U1,"+",U2,"+",U3
1100 LET L$=B$[1,9],"[STANDARD ERROR OF ESTIMATE(SEE): "
1110 LET L$=L$,"---#.###   %REL SEE:--#.##]"
1120 PRINT FILE[7],USING L$,S0,S1
1130 REM   [STANDARDS DATA]
1140 LET L$="REPLICATE SETS OF",B$[1,14],"DE "
1150 LET L$=L$,"VALUES OF APHA STANDARDS"
1160 PRINT FILE[7]
1170 PRINT FILE[7],L$
1180 LET V$="     ADMI"
1190 LET L$="STANDARDS (DATED)",V$[2],V$,V$,V$,V$,V$
1200 PRINT FILE[7],L$
1210 LET L$=" WITH STATISTICS      25        50       "
1220 LET L$=L$,"100       150       200       250"
1230 PRINT FILE[7],L$
1240 LET V$="  -------"
1250 LET L$="-----------------",V$,V$,V$,V$,V$,V$

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/3/1980                                                  PAGE  4
                     PROGRAM LISTING FOR UVV0.L5

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
1260 PRINT FILE[7],L$
1270 LET V$="  -#.####"
1280 LET L$="##################",V$,V$,V$,V$,V$,V$
1290 LET V$="REPL.  (00/00/00)"
1300 FOR I=1 TO N
1310   LET D$=V$
1320   LET D$[6,6]=STR$(I)
1330   LET D$[10-INT(M[I,7]/10),10]=STR$(M[I,7])
1340   LET D$[13-INT(LOG(M[I,8])/LOG(10)+5E-03),13]=STR$(M[I,8])
1350   LET D$[15,16]=STR$(M[I,9]-INT(M[I,9]/100)*100)
1360   PRINT FILE[7],USING L$,D$,M[I,1],M[I,2],M[I,3],M[I,4],M[I,5],M[
*      I,6]
1370 NEXT I
1380 LET L$[1,17]="REPLICATES MEAN  "
1390 PRINT FILE[7],USING L$,U[1],U[2],U[3],U[4],U[5],U[6]
1400 LET V$="   #.####"
1410 LET L$="###################",V$,V$,V$,V$,V$,V$
1420 LET V$="MEAN STAND. DEV. "
1430 PRINT FILE[7],USING L$,V$,S[1],S[2],S[3],S[4],S[5],S[6]
1440 LET V$="  ---#.##"
1450 LET L$="################",V$,V$,V$,V$,V$,V$
1460 LET V$="% REL. STND DEV"
1470 PRINT FILE[7],USING L$,V$,R[1],R[2],R[3],R[4],R[5],R[6]
1480 CLOSE FILE[7]
1490 REM ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
1500 REM                         REPORT OUTPUT
1510 REM
1520 ON ESC THEN GOTO 2000
1530 ESC
1540 ON ERR THEN GOTO 1610
1550 PRINT
1560 PRINT "REPORT OUTPUT:  TERMINAL[1], LINEPRINTER[2], ";
1570 INPUT "OR CONTINUE[3(CR)]  >>> ",A$
1580 ON ERR THEN STOP
1590 IF LEN(A$)=0 THEN LET A$="3"
1600 ON POS("123",A$,1) THEN GOTO 1660, 1750, 2000
1610 ON ERR THEN STOP
1620 PRINT "<7>"
1630 PRINT "PLEASE ENTER 1, 2, OR 3."
1640 GOTO 1540
1650 REM   [TERMINAL REPORT]
1660 ON ESC THEN GOTO 1940

1234567891123456789212345678931234567894123456789512345678961234567897
         0         0         0         0         0         0         0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/3/1980                                                         PAGE  5
                 PROGRAM LISTING FOR UVV0.L5

1234567891123456789212345678931234567894123456789512345678961234567897
         0          0          0          0          0          0          0
1670 LET F0$="UVVLPT"
1680 OPEN FILE[7,3],F0$
1690 LREAD FILE[7],L$,W$
1700 IF EOF(7)=1 THEN GOTO 1940
1710 LET L$=L$,W$
1720 PRINT L$;
1730 GOTO 1690
1740 REM   [LINEPRINTER REPORT]
1750 ON ESC THEN GOTO 1940
1760 LET F0$="UVVLPT"
1770 OPEN FILE[7,3],F0$
1780 LET F0$="$LPT"
1790 ON ERR THEN GOTO 1880
1800 OPEN FILE[1,1],F0$
1810 ON ERR THEN STOP
1820 LREAD FILE[7],L$,W$
1830 IF EOF(7)=1 THEN GOTO 1940
1840 LET L$=L$,W$
1850 PRINT FILE[1],B$[1,4];L$
1860 GOTO 1820
1870 REM   [(LINEPRINTER FILE OPEN)]
1880 ON ERR THEN STOP
1890 PRINT "<7>"
1900 PRINT "LINEPRINTER IN USE; WILL WAIT 10 SECS. & RETRY."
1910 DELAY =9
1920 GOTO 1790
1930 REM   [(END OF / ESCAPE DURING OUTPUT)]
1940 NOESC
1950 CLOSE
1960 GOTO 1520
1970 REM +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
1980 REM            COLOR ANALYSIS MODULE RETURN POINT
1990 REM
2000 NOESC
2010 CLOSE
2020 LET F0$="UVV00.TR"
2030 OPEN FILE[0,0],F0$,21
2040 WRITE FILE[0,1],F1$
2050 WRITE FILE[0,2],F2$
2060 WRITE FILE[0,3],F3$
2070 CLOSE FILE[0]
2080 CHAIN F3$

1234567891123456789212345678931234567894123456789512345678961234567897
         0          0          0          0          0          0          0
```

```
A-U-T-'-D   U-V-V-I-S   S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R   S-Y-S-T-E-M
9/3/1980                                                         PAGE  7
                      SYMBOL TABLE FOR UVV0.L5

SYMBOL   REFERENCES
------   ----------------------------------------------------------------
0360     0180
0410     0340
1520     1960
1540     1640
1610     1540
1660     1600
1690     1730
1750     1600
1790     1920
1820     1860
1880     1790
1940     1660  1700  1750  1830
2000     0530  0570  1520  1600
A$       0230  1570  1590  1600
A1[      0240  0280  0290  0300  0310  0320  0330
B$       0230  0260  0950  0990  1000  1050  1100  1140  1850
D$       0230  0790  0800  0810  0820  0830  0950  1310  1320  1330
         1340  1350  1360
D1       0740  0750  0800
D2       0730  0770  0780  0810
D3       0720  0820  0830
F0$      0220  0380  0410  0420  0590  0600  0610  0850  0860  1670
         1680  1760  1770  1780  1800  2020  2030
F1$      0220  0380  0430  0500  0520  0590  0600  2040
F2$      0220  0380  0440  0500  0510  2050
F3$      0220  0380  0450  0510  0520  2060  2080
F5       0190  0390  0530
FL#0     0420  0430  0440  0450  0460  0470  0480  2030  2040  2050
         2060  2070
FL#1     1800  1850
FL#3     0610  0620  0630  0640  0650  0670  0700
FL#7     0860  0900  0910  0920  0940  0960  0970  1020  1030  1070
         1080  1090  1120  1160  1170  1200  1230  1260  1360  1390
         1430  1470  1480  1680  1690  1770  1820
I        0250  0260  0270  0660  0670  0690  1300  1320  1330  1340
         1350  1360  1370
L$       0230  0880  0890  0920  0930  0940  0950  0970  0980  0990
         1000  1010  1030  1050  1060  1090  1100  1110  1120  1140
         1150  1170  1190  1200  1210  1220  1230  1250  1260  1280
         1360  1380  1390  1410  1430  1450  1470  1690  1710  1720
         1820  1840  1850
M[       0240  0670  1330  1340  1350  1360
N        0620  0660  1300
N1$      0220  0460  0980  0990
N2$      0220  0470  0990  1000  1010
```

```
A-U-T-'-D  U-V-V-I-S  S-P-E-C-T-R-O-P-H-O-T-O-M-E-T-E-R  S-Y-S-T-E-M
9/3/1980                                                        PAGE  8
                      SYMBOL TABLE FOR UVV0.L5

SYMBOL   REFERENCES
------   ---------------------------------------------------------------
 P       0620  0670  0680
 R[      0240  0650  1470
 S0      0620  1120
 S1      0620  1120
 S[      0240  0640  1430
 U1      0620  1090
 U2      0620  1090
 U3      0620  1090
 U[      0240  0630  1390
 V$      0230  0760  0770  0830  1180  1190  1240  1250  1270  1280
         1290  1310  1400  1410  1420  1430  1440  1450  1460  1470
 W$      0230  1690  1710  1820  1840
```

FILE STRUCTURES

The color analysis modules use and/or create nine files. Three of the files are detailed in the tables below. (Two of these three are of the same form.) Four others and their associated tables are: 1) the system status transfer file UVV00.TR, shown in Table 2; 2) the wavelength calibration file UVV00.CF, shown in Table 3; 3) the color analysis transmittance calibration file UVVOL.CF, shown in Table 5; and 4) the 30-Selected-Ordinate method file UVV00.SF, shown in Table 15. The remaining two files are UVVLPT, a list file which stores up reports for terminal or lineprinter output, and $LPT, a list file associated with the lineprinter device.

TABLE 27. STRUCTURE OF THE COLOR ANALYSIS HISTORICAL STANDARDS FILES

File name: UVVOL.SF (automated mode)
UVVOL.SM (manual mode)

File type: fixed-length binary random access

Record length: 36

File number: 3

Record	File Content
0	K,J,U1,U2,U3,S0,S1
1	$\bar{D}_1,\bar{D}_2,\ldots\ldots,\bar{D}_6$
2	$S_1,S_2,\ldots\ldots,S_6$
3	$R_1,R_2,\ldots\ldots,R_6$
4	$D_{L,1},D_{L,2},\ldots,D_{L,6},X_L,Y_L,Z_L$
5	. . .
6	. . .
7	. . .
8	. . .
9	. . .
10	$D'_1,D'_2,\ldots\ldots,D'_6$

Where:

K is number of replicate sets of standards ($0 \le K \le 6$)
J is oldest standard ($1 \le J \le 6$)
U1,U2,U3 are constants of the standards curve
S0 is standard error of estimate (SEE)
S1 is percent relative SEE
$\bar{D}_I$ is mean DE of Ith standard
S_I is standard deviation of mean DE of Ith standard
R_I is percent relative standard deviation of mean DE of Ith standard
$D_{L,M}$ is DE of Mth standard of Lth replicate set, where: $1 \le M \le 6$; $1 \le L \le K$
X_L,Y_L,Z_L are update date (month, day, year) of Lth standard
D'_M is DE of Mth present update standard

TABLE 28. STRUCTURE OF THE COLOR ANALYSIS DATA SUMMARY FILE

File name: UVVOL.DS

Record length: 21 bytes

File type: fixed-length binary random access

File number: 4

Record	File Content
0	M0,N1,N2,P1
.	.
.	.
.	.
I	M,C$,A,D
.	.
.	.
.	.
.	.
J	M',U$,D,K
(J+1)	(C1$)
(J+2)	(C1$')
.	.
.	.
.	.

Where:

M0 is sample-type flag
N1 is check standards counter
N2 is unknowns counter
P1 is sample pointer
I,J are any integer record numbers
M (=2) is marker for some check standard
C$ is sample identifier for some check standard
A is expected ADMI of some check standard
D is computed DE of some check standard or unknown
M' (=3) is marker for some unknown
U$ is sample identifier for some unknown
K is number of records used for some unknown comment (K = 0, 1, or 2)
C1$ is, if needed, up to first 15 characters of some unknown comment
C1$' is, if needed, 16th through last characters of some unknown comment

TABLE 29. STRUCTURE OF THE COLOR PLOT REFERENCE FILE

File name: UVVOL.PR

File type: fixed-length binary random access

Record length: 41 bytes

File number: 6

File Content

Record formats are detailed in Table 8. The form of the headings defined in that table are, for UVVOC.PR, as follows:

Heading	Form for update standard
H0$	"UPDATE STANDARD"
H1$	"ADMI OF APHA STANDARD: ###"
H2$	"CONTROL STANDARDS MEAN DE: ±#.####"
H3$	"MEASURED DE: ±###.###"
H4$	"CONTROL RATING: ##########" *

Heading	Form for check standard
H0$	"CHECK STANDARD"
H1$	"IDENTIFIER: ########"
H2$	"EXPECTED ADMI: ###"
H3$	"MEASURED ADMI: ±###.###"
H4$	"CONTROL RATING: ##########" *

Heading	Form for unknown
H0$	"UNKNOWN"
H1$	"IDENTIFIER: ########"
H2$	"COMMENT: ##############################"
H3$	"MEASURED DE: ±#.####"
H4$	"CALCULATED ADMI: ±###.###"

* These ratings may be: "IN CONTROL", "WARNING" or "OUT OF CTL"

Note: # symbol represents an alphanumeric character.

SECTION 8

DATA ACQUISITION/REDUCTION SUBROUTINE

The Data Acquisition/Reduction (DAR) subroutine is used in the sample analysis modules UVVO.Q2, UVVO.C2, and UVVO.L2. It is also used in UVVO.TO. Figure 20 demonstrates the DAR subroutine algorithm.

The DAR subroutine scans a sample and reduces scan data to transmittance A/D counts at integer nanometer increments throughout the scan range. The scan is broken down into portions. After each portional scan, the transmittance signals are evaluated throughout the range of the partial scan. Another scan is made, and another set of transmittance signals is evaluated. This routine is repeated until the scan range is completely evaluated.

It is necessary to understand the forms of the scan array V, which contains data from partial scans, and the array Z, in which evaluated A/D counts are stored. Also, realize that all scans are in a downward direction, i.e. from higher to lower wavelengths.

V is arranged as sequential pairs of wavelength-transmittance A/D counts. The Jth and (J-1)th elements of V constitute, respectively, corresponding wavelength and transmittance A/D counts. Also, the Jth element represents a higher wavelength than the (J+2)th element.

Z is filled from the beginning to the end. The scan range is from the highest nanometer wavelength bound, W1, to the lowest bound, W0. Therefore, (W1-W0+1) elements are needed in the Z array. The transmittance signal at W1 is place in the first element of Z, while the signal at W0 is placed in the (W1-W0+1)th element. Thus, in general, the signal at K nanometers is placed in the (W1-K+1)th element of Z.

Three other small points should be made. Firstly, the INT function yields the low bound integer of a number. Secondly, an escape issued before or after the operation of the CALL 7 is handled in the same way as the mid-scan escape, except that no CALL 257 "scan-clear" is issued. Thirdly, the variables as noted in Figure 20 may be of a slightly different notation in the various modules. For the purpose of clarity, the following table explains these alternate notations.

TABLE 30. ALTERNATE VARIABLE NOTATIONS FOR THE DAR SUBROUTINE

Variable (in Figure 20)	Alternate notation	Modules with alternate
Z(W1-W0+1)	Z(2,(W1-W0+1))	UVV0.T0
P1,P0	K1,K0	UVV0.Q2, UVV0.C2, UVV0.L2
N0	N1	UVV0.Q2
V()	V0()	UVV0.Q2, UVV0.C2, UVV0.L2

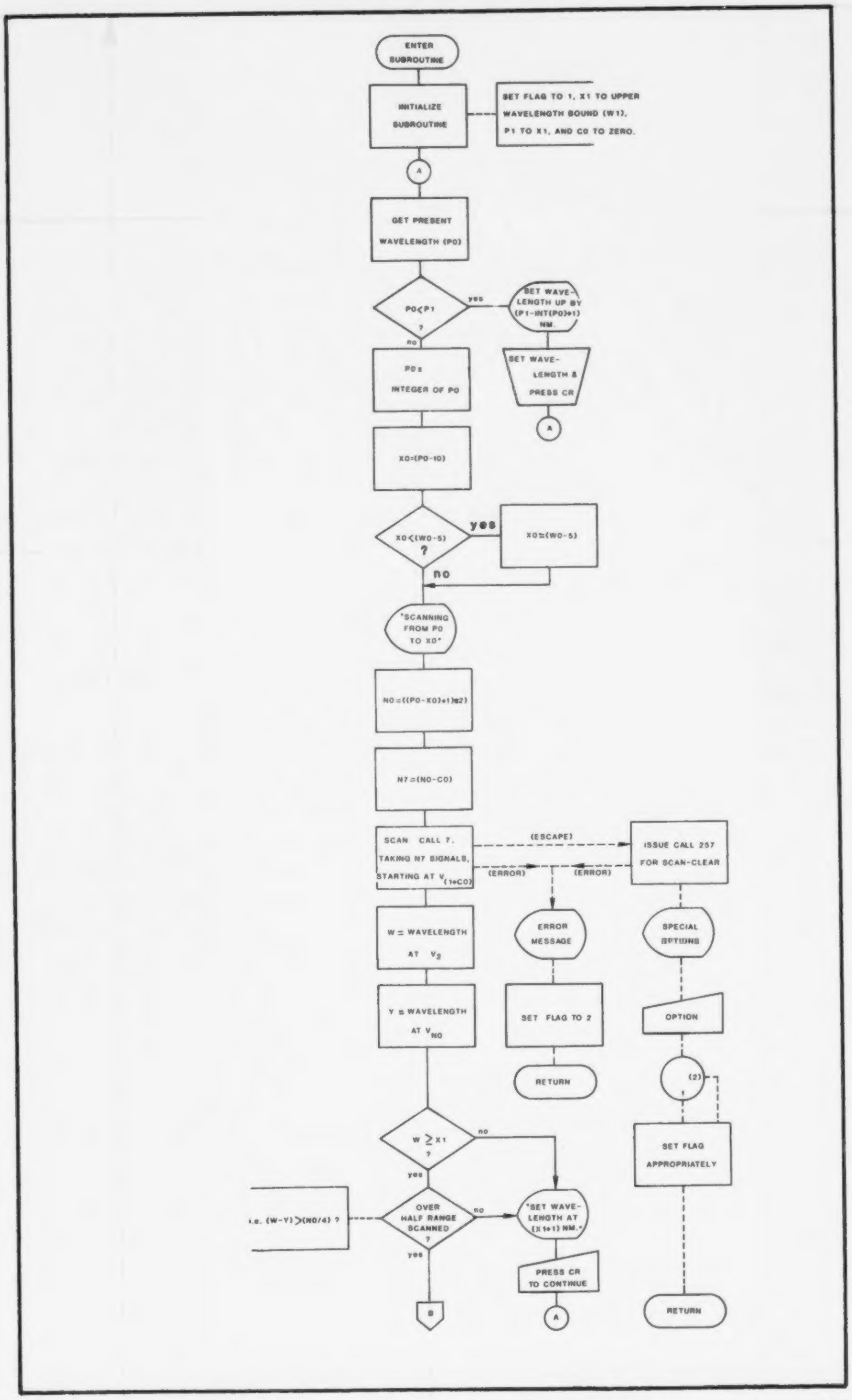

ENTER SUBROUTINE
INITIALIZE SUBROUTINE
SET FLAG TO 1, X1 TO UPPER WAVELENGTH BOUND (W1), P1 TO X1, AND C0 TO ZERO.
A
GET PRESENT WAVELENGTH (P0)
P0<P1 ?
yes
SET WAVE-LENGTH UP BY (P1-INT(P0)+1) NM.
SET WAVE-LENGTH & PRESS CR
A
no
P0= INTEGER OF P0
X0=(P0-10)
X0<(W0-5) ?
yes
X0=(W0-5)
no
"SCANNING FROM P0 TO X0"
N0=((P0-X0)+1)*2)
N7=(N0-C0)
SCAN CALL 7. TAKING N7 SIGNALS, STARTING AT V(1+C0)
(ESCAPE)
ISSUE CALL 257 FOR SCAN-CLEAR
(ERROR)
(ERROR)
ERROR MESSAGE
SET FLAG TO 2
RETURN
SPECIAL OPTIONS
OPTION
(2)
1
SET FLAG APPROPRIATELY
RETURN
W = WAVELENGTH AT V2
Y = WAVELENGTH AT VN0
W ≥ X1 ?
no
yes
OVER HALF RANGE SCANNED ?
i.e. (W-Y)>(N0/4) ?
no
"SET WAVE-LENGTH AT (X1+1) NM."
PRESS CR TO CONTINUE
A
yes
B

Figure 20. Flowchart of the Data Acquisition/Reduction subroutine.

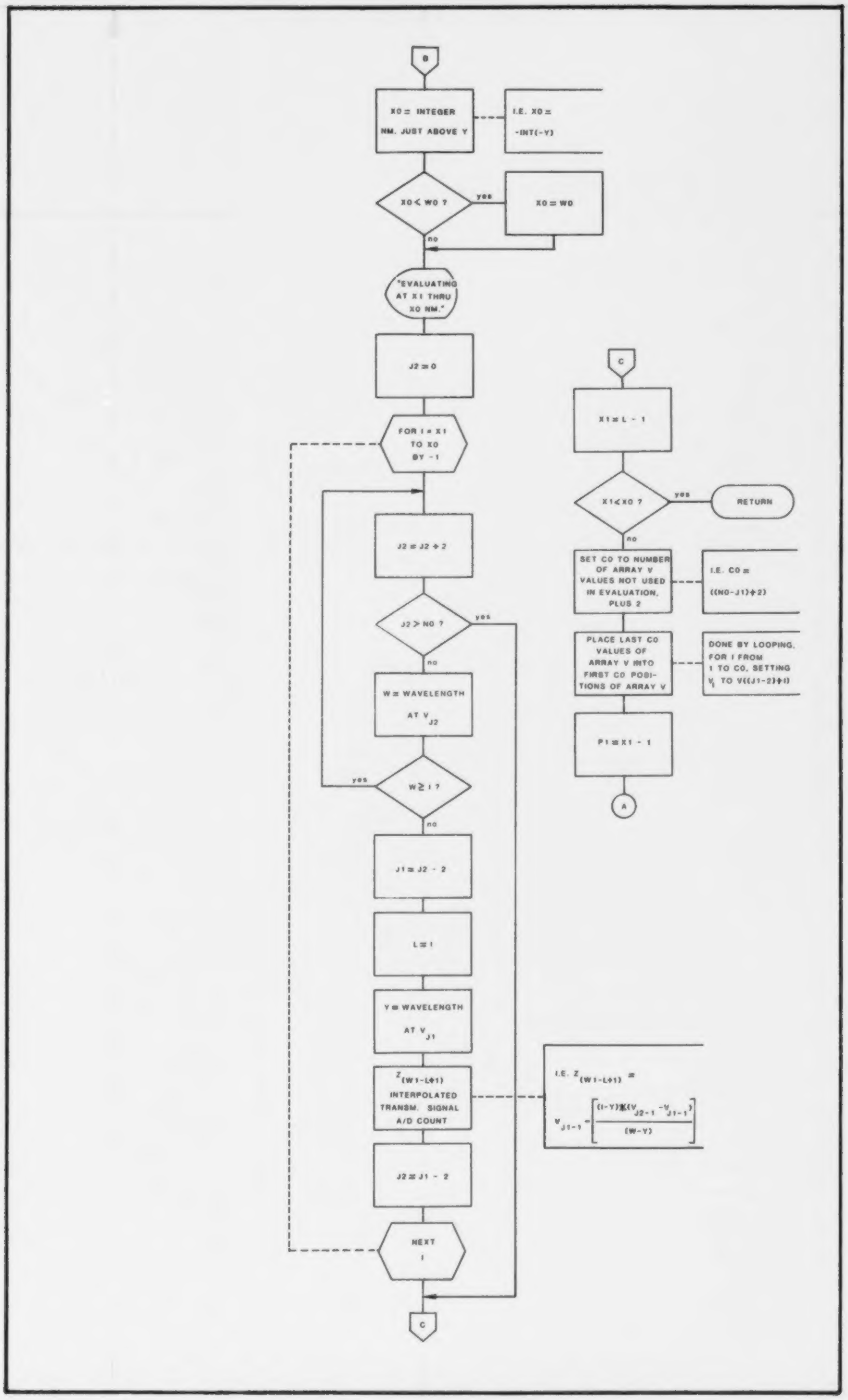

B
X0 = INTEGER NM. JUST ABOVE Y
I.E. X0 = -INT(-Y)
X0 < W0 ?
yes
X0 = W0
no
"EVALUATING AT X1 THRU X0 NM."
J2 = 0
FOR I = X1 TO X0 BY -1
J2 = J2 + 2
J2 > N0 ?
yes
no
W = WAVELENGTH AT V J2
W ≥ I ?
yes
no
J1 = J2 - 2
L = I
Y = WAVELENGTH AT V J1
Z (W1-L+1) INTERPOLATED TRANSM. SIGNAL A/D COUNT
I.E. Z (W1-L+1) = V J1-1 - [(I-Y)*(V J2-1 - V J1-1) / (W-Y)]
J2 = J1 - 2
NEXT I
C
C
X1 = L - 1
X1 < X0 ?
yes
RETURN
no
SET C0 TO NUMBER OF ARRAY V VALUES NOT USED IN EVALUATION, PLUS 2
I.E. C0 = ((N0-J1)+2)
PLACE LAST C0 VALUES OF ARRAY V INTO FIRST C0 POSITIONS OF ARRAY V
DONE BY LOOPING, FOR I FROM 1 TO C0, SETTING V I TO V((J1-2)+I)
P1 = X1 - 1
A

Figure 20. Flowchart of the Data Acquisition/Reduction subroutine.

SECTION 9

SCANNING MECHANISM SPEED CHECKING/SETTING ROUTINE

The scanning mechanism speed checking/setting routine is one of the commands available in any of the automated analysis modules UVVO.Q1, UVVO.C1, or UVVO.L1. The flowchart of the code is shown in Figure 21.

To begin the routine, the present scan speed, if available, is retrieved from the transmittance calibration file (UVVO.CF, or UVVOL.CF). Options are offered for: 1) checking the present actual scan speed with the present expected speed; 2) setting the scan speed; and 3) continuing the analysis. The latter option induces a return to the analysis module's command line. For the first option, a variable P is set to one, while for the second option, P becomes two.

A scan is then made. The length of the scan is based on the value of P, and is set to five seconds for checking, ten seconds for setting.

For checking, wavelengths after two and five seconds are derived. The nanometers-per-minute scan speed is computed, and is displayed, along with the expected speed and the difference between the two.

For setting, wavelengths after two, six, and ten seconds are derived. The two-to-six second and the six-to-ten second scan speeds (in nanometers per minute) are computed. If the two speeds differ by more than 5%, then the apparent inconsistency of the speed is noted at the terminal, followed by a return to the option line. Otherwise, the speed is displayed and, at the discretion of the users, accepted or rejected. An accepted result is placed in the transmittance calibration file.

Should an escape be issued during the scan, a CALL 257 for "scan-clear" is issued. With this and all other escapes, program control returns to the option line.

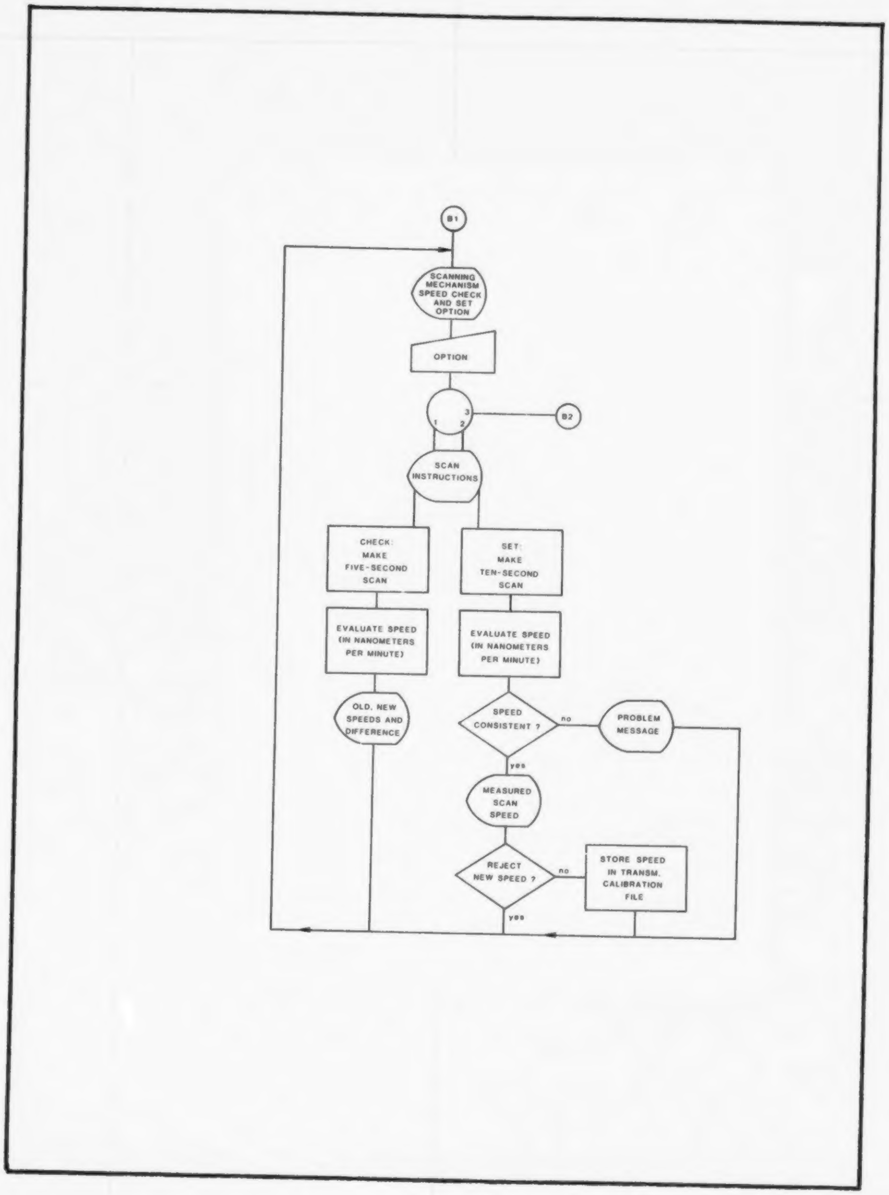

B1
SCANNING MECHANISM SPEED CHECK AND SET OPTION
OPTION
3
1
2
B2
SCAN INSTRUCTIONS
CHECK: MAKE FIVE-SECOND SCAN
SET: MAKE TEN-SECOND SCAN
EVALUATE SPEED (IN NANOMETERS PER MINUTE)
EVALUATE SPEED (IN NANOMETERS PER MINUTE)
OLD, NEW SPEEDS AND DIFFERENCE
SPEED CONSISTENT ?
no
PROBLEM MESSAGE
yes
MEASURED SCAN SPEED
REJECT NEW SPEED ?
no
STORE SPEED IN TRANSM. CALIBRATION FILE
yes

Figure 21. Flowchart of the Scanning Mechanism Speed Checking/Setting routine.

REFERENCES

1. Taber, L., Ames., H.S., Yamauchi, R.K., and Barton, G.W. "Instrument Calls and Real-Time Code for Laboratory Automation," Lawrence Livermore Laboratory, University of California, Livermore, California, 1978.

2. Teuschler, J., "Documentation for the BASIC Plotting Package," unpublished document. Copies available from EMSL-Cincinnati, 1978.